

AI AUTOMOTIVE INDUSTRIES

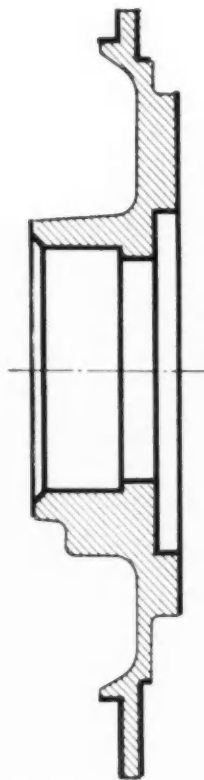
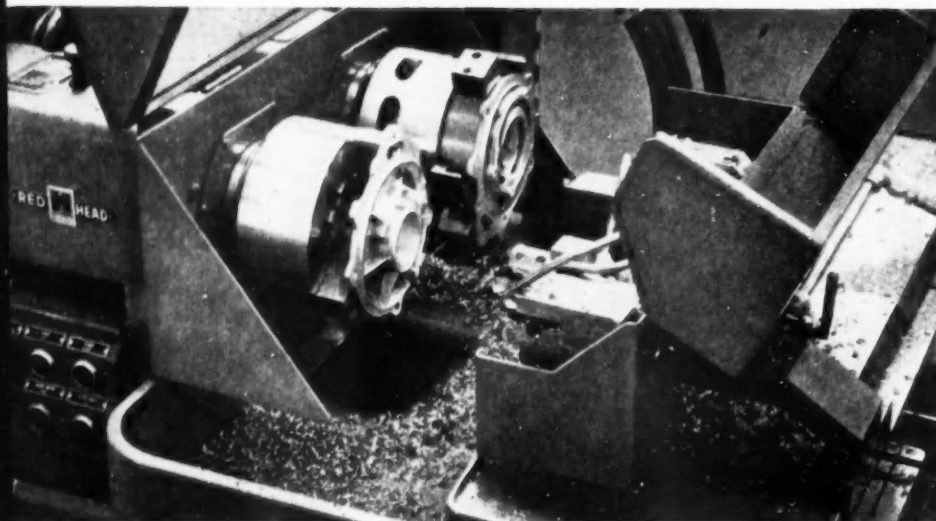
FEBRUARY 15, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue . . . Russian Tractors Latest Body Techniques
. . . . New Buda Diesel Brussels Show
COMPLETE TABLE OF CONTENTS, PAGE 3 SAE Highlights Waukesha Turbosupercharged
Diesels IHC 1953 Trucks Job Analysis

A CHILTON PUBLICATION

13 surfaces borized in 3 operations on 2 Heald Bore-Matics



The 12 surfaces indicated above are precision borized on the Heald Model 221 Bore-Matic shown at left — one station for finishing each side of the work.

● Here's another example of how Heald machines make fast work of a complicated, multi-surface borizing job. The parts — aluminum die-cast pump casings — are first bored, faced, turned and chamfered on 12 different surfaces with the two-station Model 221 Bore-Matic shown above. A bridged-over quill for the boring operations allows the boring tool to remain fixed while the facing tools are indexed laterally. One station is used for each side of the work.

After part has been finished on this machine, a bronze bushing is pressed in and work is transferred to the Model 121 Bore-Matic shown at the right. Here the bushing is precision bored by a single tool on the machine table.

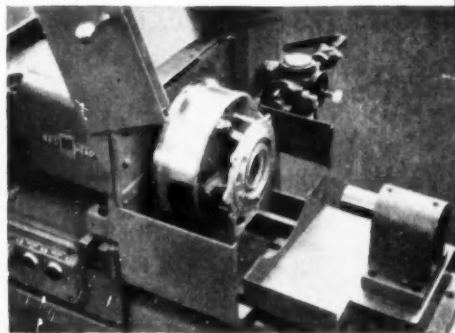
Remember—when it comes to precision finishing, it pays to come to Heald.



Case Study
No. 2233-96 in
**PRECISION
PRODUCTION**



The final operation — finish boring of the bronze bushing inserted in the work — is done on the single station Model 121 Bore-Matic shown below.



INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



On the Mesabi Range this 20-tonner hauling iron ore is a Walter Dumper powered by a Waukesha Super-Duty Six 6-WAK Butane Engine

WAUKESHA

Super Duty Six

1197 CU. IN. 6-WAK SERIES

ENGINES

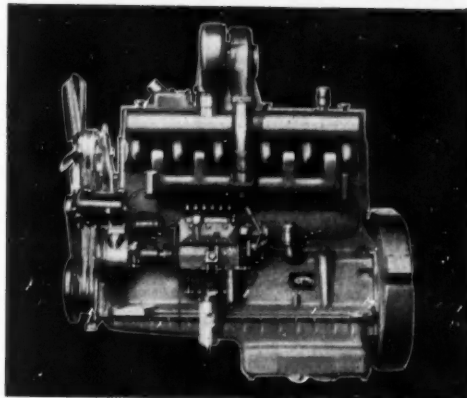
includes

- 6-WAK—Butane Engine
- 6-WAK—Gasoline Engine
- 6-WAKD—Diesel Engine
- 6-WAKDS—Supercharged Diesel Engine

UP TO 352 MAXIMUM HORSEPOWER

Standard or Counterbalanced Crankshafts Available.
Consult Waukesha on permissible speeds for your service.

Send for Bulletins.



New Supercharged 6-WAKDS Diesel, with center-mounted turbocharger; 6-cyl., 6¼ x 6½, 1197 cu. in., 352 max. hp.

WAUKESHA MOTOR COMPANY •
NEW YORK TULSA

WAUKESHA, WISCONSIN
LOS ANGELES 192

Incoloy

may be the alloy to use
where corrosion and high temperatures
are causing trouble

Incoloy			
Preliminary Creep and Rupture Data			
Condition: Course Grained-Annealed*			
Creep			
Stress, psi, to Produce a Minimum Creep Rate of:			
Temp. F	.01% 1000 hrs.	.10% 1000 hrs.	
1400	4400	5500	
1600	2000	2900	
1800	250	500	
2000		200**	

Rupture			
Stress, psi, to Produce Rupture in:			
Temp. F	1000 hrs.	10,000 hrs.	100,000 hrs.
1400	8700	6000	(4200)
1600	3800	2200	(1300)
1800	1700	1100	(670)
2000	850	(540)	

*2 hrs. 2050 F AC
** .07% 1000 hrs. (4000 hrs.)

Incoloy® was developed as a companion to Inconel®, long considered one of industry's most durable high temperature metals.

Extensive laboratory and field tests indicate that Incoloy gives a particularly good account of itself under corrosive high-temperature conditions — conditions, for example, such as you find every day in the exhaust systems of heavy-duty, gasoline-powered trucks.

Like Inconel, the new alloy offers good strength at elevated temperatures up to 1800° F., and good resistance to oxidation. Yet Incoloy, having a lower nickel content, is likely to provide greater resistance to sulfur attack. It may, for this reason, prove an even better choice than Inconel for certain special purposes.

In structure, Incoloy is stably austenitic, and shows no tendency to become embrittled by precipitation of sigma or carbide phases after prolonged exposure to intermediate temperatures.

Note also, in the tables (left), the important preliminary creep and rupture data which have been developed on Incoloy.

Like Inconel, the new alloy is readily workable, both hot and cold. Its rate of work hardening is practically the same as that of Inconel. And Incoloy can be welded by commonly-used methods.

All of the usual mill forms are produced — billets, rounds, flat, hexagons, sheet and strip, rods, tubing and wire. Consult your distributor of Inco Nickel Alloys for the latest information on availability from warehouse and mill. And remember — it usually helps to anticipate your requirements well in advance.

Remember, too, that you can always call on Inco's High Temperature Engineering Service for assistance in selecting the *right* metal for any high temperature application. All you need do is write and ask for a copy of the "High Temperature Worksheet." This is a simplified form especially designed to help you highlight the essential facts of your particular problem. The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

Inco Nickel Alloys



Incoloy...for Heat-Resisting Applications

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

AI

AUTOMOTIVE INDUSTRIES

FEBRUARY 15, 1953

VOL. 108, NO. 4

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MEMBER



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EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, February 15, 1953

This Jig is easy to handle because it is made of aluminum (Alcoa Aluminum Tool & Jig Plate). It also costs substantially less than if it were made of steel because material costs are lower, and machining is faster.

Many manufacturers are using Alcoa Tool & Jig Plate for assembly and machining fixtures, dies for low-pressure molding of rubber and plastic, and dies for forming aluminum sheet.

Alcoa Tool & Jig Plate is a cast product, normalized, available from stock in widths $\frac{1}{4}$ " to 4". It is machined to close tolerances on both sides.

Maximum size is 48" x 96". Aluminum Company of America, 1951-B Alcoa Building, Pittsburgh 19, Pa.

**ALCOA ALUMINUM
TOOL & JIG
PLATE**



Alcoa
Aluminum



ALUMINUM COMPANY OF AMERICA

ONE TAPE replaces all packs, wraps and compounds



Replacing complicated and cumbersome wraps and packs. Polyken No. 822 is equally good for high or low-voltage protection. Though it is shown here on a low-voltage switch gear, Polyken No. 822 is the one tape that does all electrical jobs—and economically, too.

A remarkable improvement has been made in insulating materials. The new Polyken Tape No. 822 does the whole job by itself. No packs, wraps or compounds are needed. Your insulation takes only half as long to apply.

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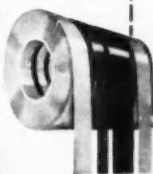
- Only 9 mils thick, but with a dielectric strength of 10,000 volts.
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- It's elastic, stretches to conform to odd-shaped surfaces.
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HYDRAULIC SYSTEMS CONTAMINATED by external rust preventive which had seeped into the working parts. Hoffman anticipated a complete machinery teardown.



CLEANED WITHOUT TEARDOWN. Sunvis H.D. 700 Oils freed hydraulic systems and internal parts, enabled Hoffman to start production within the time specified by the Navy.

HYDRAULIC SYSTEMS OF MOTHBALLED MACHINES CLEANED WITHOUT TEARDOWN BY SUNVIS H.D. 700 OILS

Recently the U.S. Hoffman Machinery Corporation was asked to reopen a World War II Navy-owned shell-making plant and start production in three months. The machinery, idle for 5 years, had been protected by an external layer of rust preventive. Hydraulic lines were among the parts coated, and some of the protective material had seeped into them. It looked as if the machinery might have to be torn down to be cleaned.

Sun and several other oil companies surveyed the equipment and suggested cleaning methods. Hoffman chose Sun's recommendations because of their soundness and Sun's record for reliable

service in other Hoffman plants. Sunvis H.D. 700 Oils freed up the hydraulic systems, many of which were extremely sluggish; and the detergency of these oils flushed away every trace of sludge and rust preventive. Sun Spirits did the external cleaning job. No dismantling of equipment was necessary.

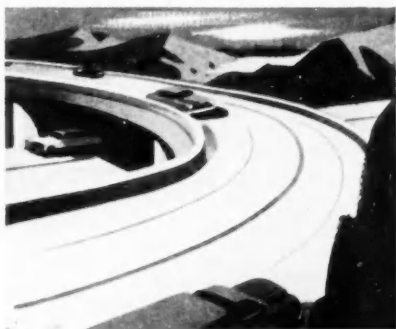
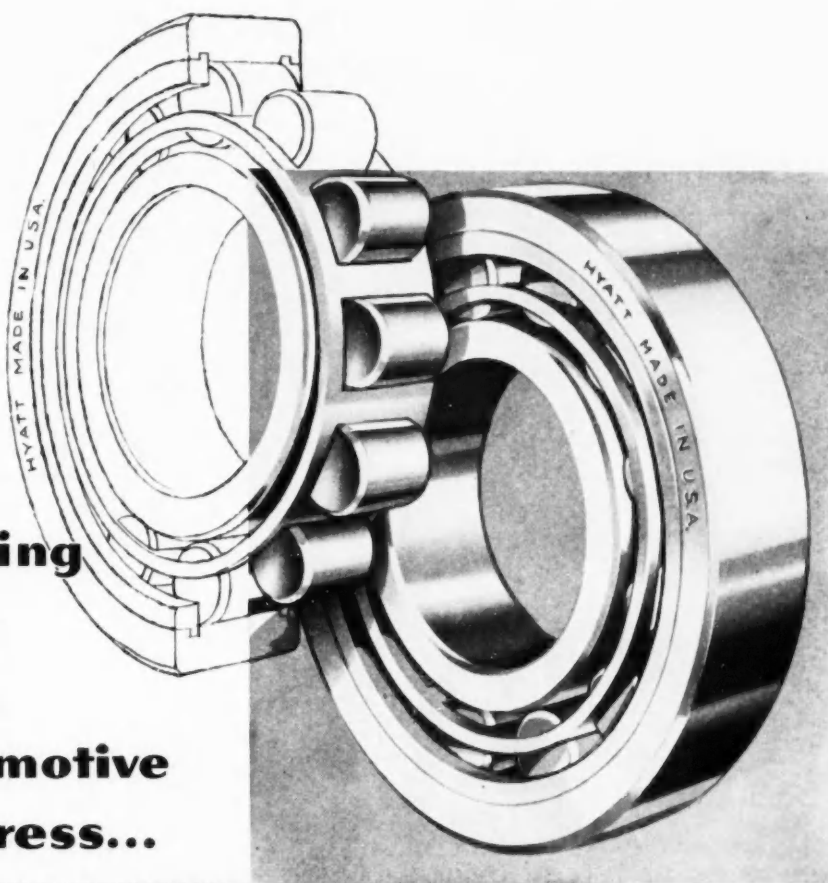
Let Sun help you solve your hydraulic, metal-working and lubrication problems. Write for your copy of "Sunvis H.D. 700 Oils" or for the services of a Sun representative, without obligation, of course. SUN OIL COMPANY, Department AA - 2, Philadelphia 3, Pa.

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pace
with
automotive
progress...**



Hyatt precision bearings

Once again automotive engineers have translated "designs of the future" into the cars of today . . . the sleek 1953 models now rolling over our highways. And again, Hyatts are the preferred bearings for these cars—because Hyatt's far-reaching research and precision manufacturing, backed by more than sixty years of bearing experience, have kept pace with the tremendous strides of the automotive industry. There is no substitute for Hyatt quality in car, truck, and bus applications. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey and Detroit, Michigan.

HYATT **ROLLER BEARINGS**



This United Oil Bath Air Cleaner is standard equipment on both the new Statesman and Rambler models.

For 1953
Nash standardizes on
UNITED
OIL BATH
Air Cleaners

United Specialties Air Cleaners are standard equipment on the new Nash Statesman. Owners of these fine automobiles are assured of the utmost in engine protection because United Oil Bath Air Cleaners remove practically all harmful dust and abrasives from air entering the engine — protect rings, sleeves, bearings, pistons and cylinder walls from excessive wear.

United Oil Bath Air Cleaners are substantially lengthening the life of every type of internal combustion engine — on cars, trucks, buses, tractors, stationary power units.

Specialists for over 30 years in the development of air cleaners, United has models available to fit every requirement. We invite you to consult with our sales engineers on your specific needs.



UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28
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New 1953 Nash Statesman.

★ **AIR CLEANERS** ★ **METAL STAMPINGS** ★ **DOVETAILS** ★
IGNITION AND TURN SIGNAL SWITCHES ★ **ROLLED SHAPES**

**NEW STEERING EASE...
INSTALLATION FREEDOM...**



HYDRAPOWER

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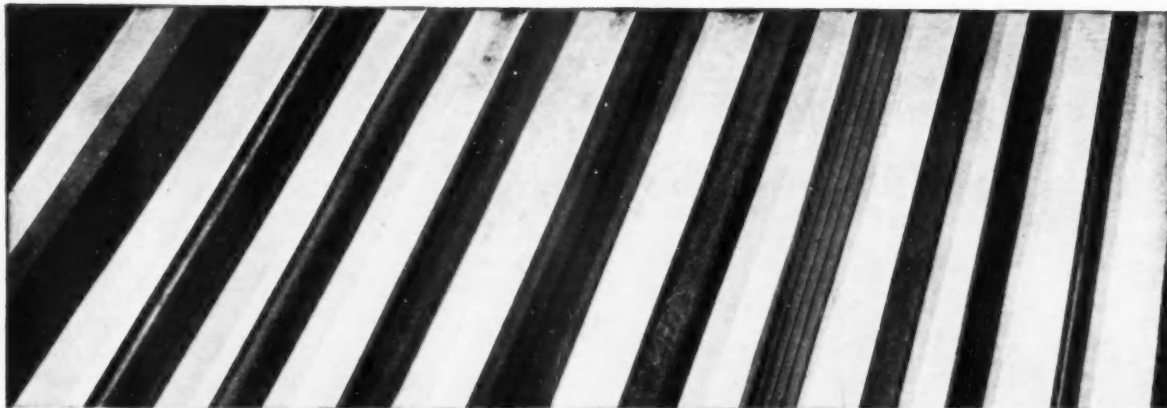
Ross Hydrapower—product of almost a *half century* of exclusive steering specialization—gives *effortless, fatigueless* power steering for commercial vehicles and passenger cars alike.

Ross Hydrapower's unusual versatility . . . and "tailor fit" adaptability to *any* steering problem . . . is shown by the eight typical sketches above—four for *left-hand* and four for *right-hand* outlet. The power cylinder can be rotated to *any* position . . . and valve can be assembled in *four* different positions—giving *maximum installation freedom* to avoid chassis interference.

Ross Hydrapower brings new steering ease and satisfaction . . . new safety for driver and passengers . . . new protection for vehicle and payload. We invite discussion of any steering problem.

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

AUTOMOTIVE INDUSTRIES, February 15, 1953



Unsurpassed
Synthetic
RUBBER
COMPONENT
PARTS



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- Channel
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- Roll Goods
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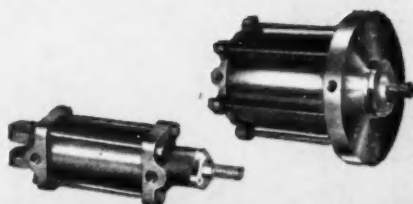
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Write for
Bulletin 210



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MOST COMPLETE LINE
OF AIR CONTROL
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NEW! REVOLUTIONARY HANNIFIN P-M Pilot-Master Valves

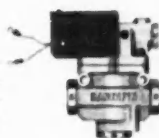
Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

Write for Bulletin 231.

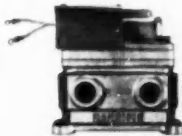
2 and 3-Way Valves.

Same valve operates 2-way or 3-way, normally open or normally closed. $\frac{3}{8}$ " to $1\frac{1}{4}$ " I.P.S.

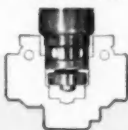


4-Way Valves.

Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ " I.P.S.

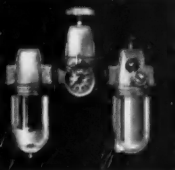


EXCLUSIVE REPLACEABLE CARTRIDGE



AIR WARDEN

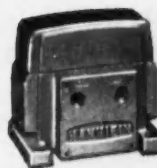
Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 1010B.



Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: $\frac{1}{4}$ " to $1\frac{1}{4}$ " I.P.S.

Write for Bulletin 57-W



Hannifin "Directair" electrically controlled air-operated disc valve

Foot-operated
treadle valve
(Also spring return
and rotary types)

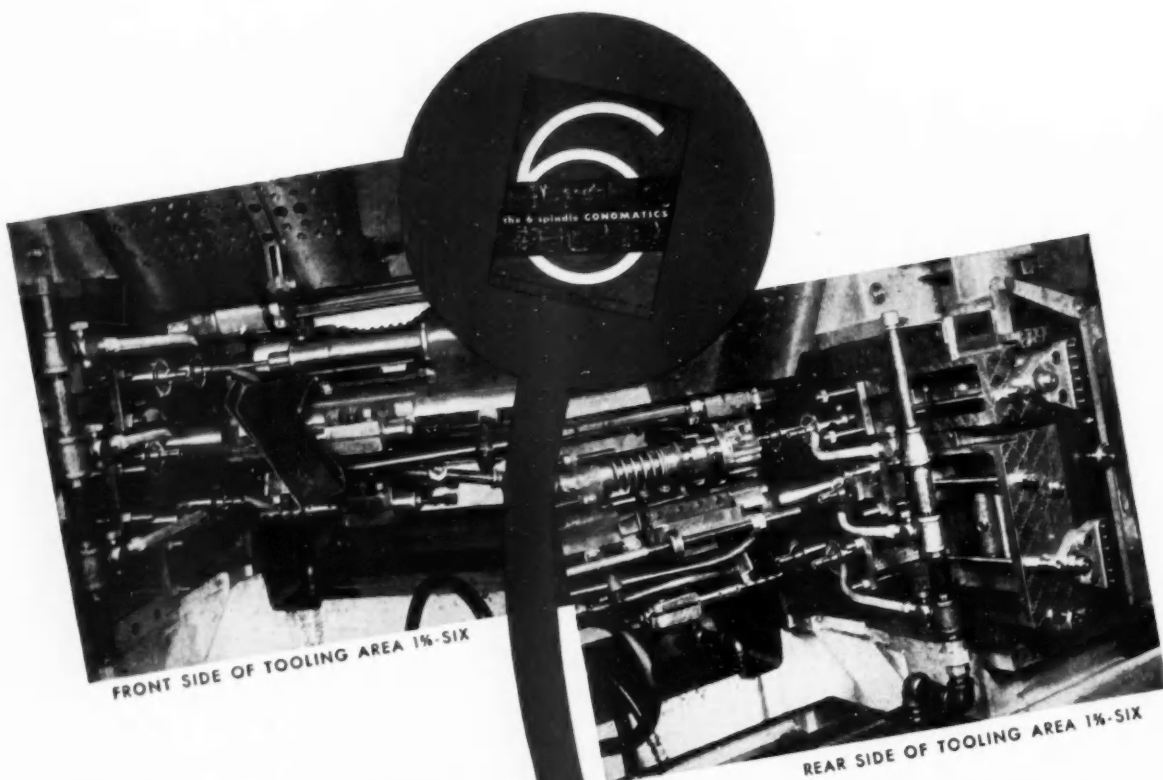


Standard hand
control valve
(Single or duplex)

HANNIFIN

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Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

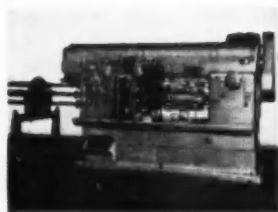


THE IMPORTANT REQUIREMENT

All brands of multiple spindle bar automatics offer value or they would not be on the market. If it were possible to engineer and incorporate the superior qualities of all into one machine, certain features would still be considered more important than others in accordance with the individual buyer's requirements.

But there is one essential quality required of all brands — regardless of the job. It is *dependable, low cost performance!* CONOMATIC users know well its benefits. But you don't have to be a user to know about this feature, or any other feature, of the CONOMATIC. Just write, wire, or phone for the information. There is no obligation.

Cross drilling without costly spindle stopping is one of many CONOMATIC innovations which make use of the machine's unexcelled accommodation to tools and work. But any such facility that saves secondary handling is valuable only because of the more important "built in" qualities that keep the machine running.



A Comparison of ALL Automatics is in favor of Cone

Conomatic } **CONE AUTOMATIC MACHINE COMPANY, INC.**
WINDSOR, VT., U.S.A.



*Squeezed like an
accordion, welded
tubing demonstrates
uniform strength*

● This compression folding of a section of electric-welded steel tubing produces no cracks or flaws. Such uniform strength is proved in many other severe cold forming operations. U. S. Bureau of Standards tests show that the weld is as strong as the wall, and that it has the same qualities as the steel.

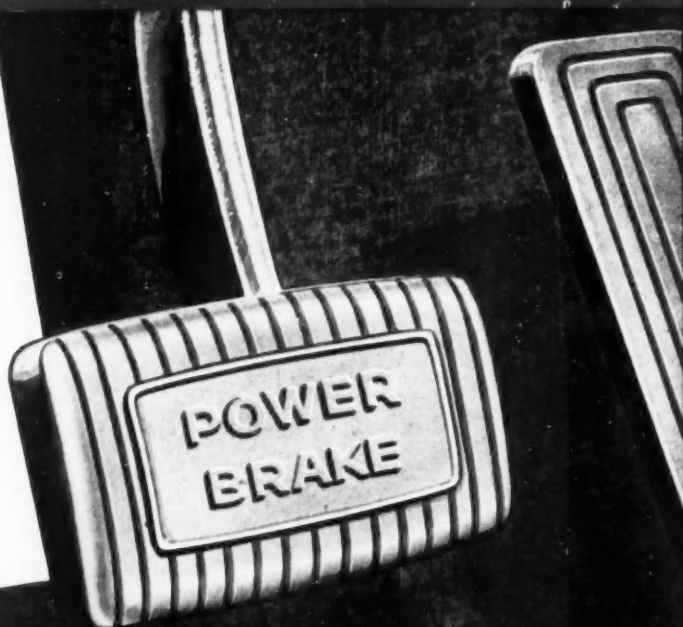
Investigate the economy and physical advantages of Brainard welded steel tubing in *your* products. Write Brainard Steel Division, Dept. W-2, Griswold Street, Warren, Ohio. An integrated producer; offices throughout the U. S.



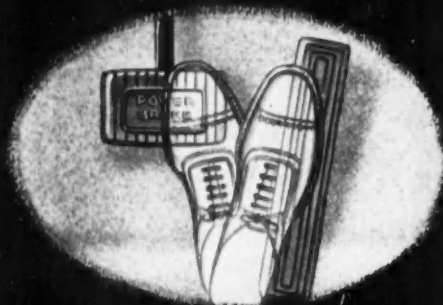
WELDED STEEL TUBING

Bendix leads again...

with
the only
performance proven
LOW PEDAL
power brake



NOW *Stopping*
IS AS EASY AS *starting*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result: • More driving comfort, less fatigue and greater safety.

The Greatest Improvement in Braking Since Four Wheel Brakes

One of the most popular new car features offered the public in years is the performance proven low pedal power brake engineered and manufactured by Bendix, the industry's leader in all types of braking.

The Bendix* low pedal power brake represents an entirely new conception of power braking designed specifically to meet the braking requirements of the industry's latest and finest vehicles.

This great advancement in braking is unique in many ways. It is, for example, the **only low pedal power brake** that has met the tests of millions of miles under all operating conditions. It has already won the overwhelming preference in its field with car manufacturers. And this low pedal power brake is the product of Bendix, the world's largest producer of power brakes and the originator of practically every important braking development since the earliest days of the automotive industry.

Passenger car manufacturers contemplating power braking should investigate the advantages of the Bendix low pedal power brake. *REG. U.S. PAT. OFF.

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Products
Division

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Asst. Treas.—**GEORGE MAISWINKLE**

High Spots of This Issue

★ Latest Techniques in Body Assembly

Concurrently with the redesign of its 1953 passenger car bodies Dodge introduced a completely new assembly line that is keyed to fast, accurate welding operations in particular. A sightseeing tour of the setup is found in this story. Page 32.

★ Current Automotive Activities in Belgium

While this article is highlighted by an eye-witness account of the recent Brussels Automobile Show, at which American vehicles shared the stage with various European ones, an interesting analysis of Belgian production is given. Page 34.

★ Russian Tractors . . . or Potential War Machines?

This unusual piece, obtained from authoritative sources behind the Iron Curtain, sheds light on the Soviet tractor industry. A commentary by Dr. Demitri Shimkin, consultant to AUTOMOTIVE INDUSTRIES on Russian affairs, is included. Page 38.

★ Fallacies in Social Engineering

An address by Admiral Ben Moreell on the shortcomings of social engineering was one feature of the SAE Meeting in Detroit last month. Included in this report are exhibits, election of officers, and abstracts of technical papers. Page 44.

★ Job Evaluation in Automobile and Parts Plants

Based on a recent survey of 135 companies, a rather thorough analysis of an important sphere of industrial relations is presented here. The results, detailed both in the text and accompanying charts, are well worth careful study. See Page 50.

★ 35 New Product Items And Other High Spots, Such As:

Waukesha Diesels with turbo-superchargers; Buda's 165-hp Diesel; and many new features in IHC's R-line of trucks.

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT



Checking Coast to Coast for Your Steel Requirements

Business executives and buyers, faced with the problem of getting steel from stock under today's spotty supply situation, are finding Ryerson a helpful source.

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TUBING—Seamless and welded, mechanical and boiler tubes

ALLOYS—Hot rolled, cold finished, heat treated—and tool steel

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

REINFORCING STEEL—Bars and accessories, wire mesh, etc.

BABBITT METAL—Lead base, five types

RYERTEX—Plastic bearing material

MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 108, No. 4

February 15, 1953

Are You an "IGHATer"?

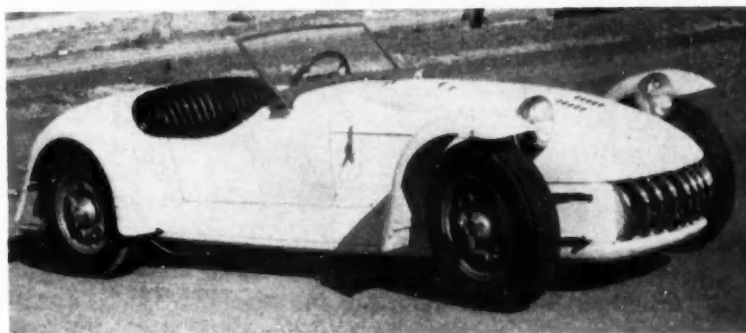
If the "IGHAT" idea ever gets active in Detroit, Chrysler Corp. probably will be a charter member. The IGHAT is an organization starting up in Chicago and its name letters stand for "I'm Gonna Holler About Taxes." It is being promoted by several large companies and its members are calling themselves IGHATers. While the approach has been mostly on the semi-humorous side, the members are very much in earnest about organizing a vocal and concerted opposition to high taxes. Chrysler recently pointed out that for the month of November its excise tax payment to the government was more than \$18 million, one of the largest in the company's history.

Chrysler also points out that the federal excise tax on its products are only one of many types of federal taxes levied and that taxes of all kinds in recent years have risen to the point where they now account for an estimated one-third of the price paid for a \$2,000 new car in Michigan. For the first nine months of this year Chrysler's total tax bill was more than \$253.4 million and over a 5-year period taxes have amounted to more than double the company's earnings. Chrysler also reports that it spends approximately \$500,000 a year on necessary paper work on all tax matters.

Ford Forms First Service Laboratory

A new technical service laboratory—said to be the first of its kind in the automobile industry—will be built by Ford Div. of Ford Motor Co. The new laboratory will house 150 service department employees, including engineers, technicians and mechanics, and will be located near the division's general office building at Livonia, Mich.

Requests for construction bids have been sent to contractors, and if materials are available, completion of



KURTIS SPORTER

New Kurtis competition sports car, patterned after Keck special driven by Yukovich last May 30, comes assembled or in kit form. Engines in built-to-order models are Cadillac, Chrysler, DeSoto, Dodge, Hudson, Lincoln or Mercury. Wheelbase is 92 to 100 in., weight is about 1900 lb. Frame is drilled box channel, with tubular sections over axles. Straight front axle has transverse torsion bars and trailing arms, while rear axle arms extend forward. Closed model will be offered.

the building is expected early next summer.

The laboratory will develop training methods and materials for use by the 33 district service schools and 33 mobile service training units in the field.

The new building will have a completely equipped model garage, classrooms, and an office area. The new building will house three main groups of the division's service department—dealer services, product information and technical standards.

The dealer service section develops and prepares training materials and publishes service manuals, new car inspection procedures and other product and service information. This section also develops standards for dealers in tools, equipment and personnel.

The product information group handles customer relations, administers product warranty and policy matters, and keeps records of product studies and field service activities.

Responsibility for the development of special service tools, repair time schedules and other maintenance procedures for Ford dealers and Ford owners rests with the technical standards section of the department.

Reo Goes into Toys, Industrial, Marine Engines

Reo Motors, Inc., is extending its diversification program by acquiring the trade name, special tooling and manufacturing rights of the Pal Wheel Goods Div. of the Northern Indiana Steel Supply Co. The company has leased the Pal Wheel Goods new million dollar plant at Michigan City, Ind., where production already is under way on tricycles, sidewalk bicycles, children's automobiles, baby strollers and lawn gym sets.

Reo also has created a new industrial and marine engine division which will greatly broaden the market for the company's varied line for large and small engines. It already has introduced a new inboard engine kit for small boats which include its 1¾-hp air cooled four-cycle engine, a reversing transmission, propeller shaft, and rudder. The division will be headed by R. D. Jacobs, II, formerly a marine installation engineer for GM Detroit Diesel Engine Div. Industrial versions of its Gold Comet engines are to be introduced in the near future.

News of the AUTOMOTIVE



SUPER VISION

With the Peridome a driver can see knees of pedestrian whose feet are under front bumper. Lucite bubble and tangential-series mirror gives 360 deg horizontal, 230 deg vertical vision. It will be tested coast to coast in blacked out car. Main use is for aircraft, control towers.

GM Air Conditioning to Cost About \$600

General Motors Corp. has ended the speculation about what air conditioning units will cost as optional equipment on Oldsmobile, Buick, and Cadillac. Price, including taxes, is \$594 installed at the factory for Buick and Olds. On Cadillac, the tab will be \$619.55.

Chrysler Corp. has not yet announced a price on its air conditioner, for which it still is tooling, although a few have been produced on temporary facilities. Packard also will offer such a unit but the price has not been set. Both the GM and Packard units are made by Frigidaire Div. of GM.

Wider Use is Predicted for Two-Stage Turbine

There is some opinion in Detroit that automatic transmissions of the "twin-turbine" type, such as Buick adopted this year, will spread through the other GM divisions and possibly to other outside companies as well. It is known that Cadillac was about ready to come out with a twin-turbine drive more than a year ago, but decided to stick with Hydramatic, at least for the time being, when dual-range came along. A big advantage of the twin-turbine type is that a planetary gear assist is available for starting and sudden spurts of power,

but without the customary noticeable shift into straight turbine drive, since the planetary set and one turbine overrun, or free-wheel, at cruising speed.

Buick Claims No. 1 "Hardtop" Position

Buick has staked out a claim to No. 1 position in production of so-called hardtop convertibles. Ivan L. Wiles, general manager, says Buick last year turned out 92,671 hardtop convertibles representing 28.8 per cent of Buick's total volume. He said that was 5000 more than the nearest competitor whom he did not name. However, he undoubtedly was referring to Ford, since that company said that its production of hardtop convertibles last year was about 88,000.

Harvester to Sell Fageol Van Trucks

International Harvester Co. has completed a selling arrangement to market the entire line of Fageol van trucks produced by Twin Coach Co. Engines, transmissions, front and rear axles, instruments and other mechanical components used in the Fageol vans are identical to those used by International in its 160 to 200 Series conventional trucks. Twin Coach says that the agreement will provide outlets for over 5000 units.

Automatic Transmission Set for Plymouth

Plymouth is the third of the big three to adopt an automatic drive as optional equipment. Beginning in April, Plymouth will offer a new automatic transmission called GY-6 Hy-Drive on all models. Price was announced as \$145.80, which is \$38.20 and \$32.55, respectively, under that of Fordomatic and Powerglide offered by its principal competitors.

The Plymouth development consists of a torque converter coupled with a conventional three speed transmission. In the main, it is similar in design to the automatic drive offered on DeSoto, Dodge and Chrysler, although there are some differences. It uses a common oil supply for the engine and transmission, with a capacity of eleven qt with a change recommended twice a year. Plymouth also will adopt an oil filter with replaceable element to be changed every 5000 miles.

The conventional three speed transmission used with the converter differs from the standard transmission in that second and low gears ratios are numerically lower. A 3.73 rear axle ratio is standard, but a 3.54 or 3.9 ratio will be optional. In operation, the driver declutches to shift into high gear, after which operation is similar to other automatic drives under all normal driving conditions. On steep grades or in other heavy pulling, the two lower gear ratios are available by a downshift using the clutch and shift lever with the same procedure applying to reverse. Like other automatic drives, it is equipped with an ignition switch hookup.

Ford to Stay in India

Although General Motors Corp. closed its assembly plant in Bombay, India, Ford Motor Co. apparently is planning to stay. The managing director of Ford Motor Co. of India says Ford does not plan to suspend operations there and is confident that the Indian government eventually will issue the necessary import licenses. GM has not announced any further plans for its Bombay operation but is reported to be considering moving it to Pakistan or selling the facilities to Indian industrialists.

AND AVIATION INDUSTRIES

Ex-Treasury Head Named Willys V.P.

John W. Snyder, Secretary of the Treasury for the last seven years of the Truman administration, has been elected vice-president in charge of finance of Willys-Overland Motors, Inc. He also was made a director and chairman of the finance committee. Willys also announced that G. E. Lyons has been elected vice-president in charge of sales to succeed Howard T. Grove, who has been made vice-president in charge of West Coast distribution. George W. Ritter was named vice-chairman of the board and re-elected executive vice-president. Raymond R. Rausch was re-elected vice-president and chairman of the executive committee and also will continue to serve as executive assistant to President Ward M. Canaday. Other officers re-elected include Delmar G. Roos, first vice-president; W. E. Harris, vice-president; Geo. R. Palmer, treasurer, and Milton McCreary, secretary.

Stable Labor Relations Seen by Car Makers

Automotive officials and others close to the labor picture see a relatively stable condition existing in the industry this year. Admittedly, there has been a little flare-up over the issue of the BLS index under which

wage rates are calculated in most automotive contracts but it is generally believed that these problems can be ironed out without too much difficulty.

A new revised BLS consumers price index was to have been adopted by March 1, but at the request of at least some members of the automotive in-

dustry and most of the rail unions, the government decided to continue the old index for another six months, at least, to prevent disruption of stable labor relations. The reason is that the UAW-CIO had sought to use the index change to reopen the entire contract and press for higher pensions and other economic matters. Consequently, it now looks as though that question will be deferred until at least mid-year. The new revised index will be published concurrently, but the old one will be used as the basis for determining wage rates.

T-H Changes

On the national front some changes are expected in the Taft-Hartley law but they are not expected to be of any major proportions or to have any significant effect on labor relations in the automotive industry. Two principal changes expected are a provision requiring employers, as well as union officials, to take anti-Communist oaths in order to obtain recognition from NLRB and elimination of the existing prohibition of voting in NLRB elections by striking workers who have been replaced by new employees. In addition, there are expected to be several other changes, none of them of significant import.

Curtice Confirmed at GM; Hoffman Returns to Studebaker



Harlow H. Curtice

Confirmation of Harlow H. Curtice as president of General Motors Corp. came from the board at its February meeting. At Studebaker Corp., the return of Paul G. Hoffman was announced.

Mr. Curtice has been acting president since last Dec. 1 and prior to that was executive vice-president of General Motors. The directors also elected Mr. Curtice chairman of the corporation's operations policy committee and administration committee. He is a member of the board, and of the financial policy committee.

The board elected Philip J. Monaghan a vice-president of General Motors and member of the administration committee. He succeeds Roger
(Turn to page 150, please)



TV SPECIAL

Fisher Body Div. modified this Cadillac 75 sedan to accommodate a television camera for the Presidential inauguration parade. Equipment includes camera and relaying transmitter, and with five-man crew weighs over one ton.

News of the AUTOMOTIVE



JET LIGHT TRAINER

Cessna Aircraft will build a prototype of its winning design for a light jet trainer for the Air Force. The all-metal plane will weigh less than 6000 lb. and will be powered by the French-designed Turbomeca engine. Continental Aviation and Engineering Corp. will build the 900-lb-thrust engine when production contracts are let.

Chevrolet Engineers Special Sports Car

It is common knowledge that Chevrolet is seriously considering going into a production run of its special sports car called the Corvette which it showed at the GM Motorama in New York in January. What is not generally known, however, is that the car is not a standard chassis with a modified engine and a plastic body, but rather is a completely engineered version of an American type sports car. Not only is the engine modified to turn up 160 hp through the use of three carburetors, dual exhaust, and higher compression ratio but there are many other changes that are not being discussed. Also, the chassis is engineered for sports car characteristics, such as greatly improved cornering. It is expected that the car will not be put on the market for at least six to nine months and possibly longer.

Cadillac Orleans Model Not for Market — Yet

Cadillac has no immediate plans to produce the "Orleans" model which it built specially for C. E. Wilson, Sec-

retary of Defense, and displayed for the first time at the GM show in New York in January. However, if a demand should develop for the car, it might be put into the schedule on a special order basis. The car is a four door sports sedan with no center pillar and a vinyl covered top. Doors swing out from the center, with a special lock for the rear doors which prevent opening while the transmission is in gear.

Higher Powered Cars Draw More Criticism

There is increasing evidence that state legislators and safety organization officials are becoming concerned about the trend toward higher horsepower in automobile engines. There have been several attacks leveled against the larger output engines announced for 1953 and there is some fear that restrictive legislation may be enacted either in the form of limiting the horsepower or imposing top speed limits where none now exist. Nonetheless, one company is seriously considering a further increase in horsepower that will place it ahead of anything now being offered. A decision is expected shortly.

Automatic Transmissions to Pass Standard in '53

Popularity of automatic transmissions continues to mount, and it is almost a certainty that this year will see for the first time more new cars sold with automatic drive than with conventional manual shift transmissions. Last year according to estimates, more than 47 per cent of all new cars sold were equipped with automatic drive and the rate of increase in acceptance should push it well over 50 per cent in 1953.

Ford Motor Co. has come up with some interesting results from a study of resale values of Ford cars equipped with automatic transmissions. It finds that such cars command a premium on the used car lots of about 70 per cent of the original cost of the automatic drive as optional equipment. Traditionally, per cent of recovery of purchase price of automatic drive on first resale has been in the neighborhood of 50 per cent. However, with popularity of such units increasing rapidly, it is becoming more difficult to merchandise late model cars which do not have automatic drive. Ford says its dealers would like to have about 75 per cent of cars they receive equipped with automatic drive. Currently, production facilities limit the number to about 33 per cent.

K-F Plans Production Run of Sports Car

Kaiser-Frazer apparently will be the first automobile manufacturer to go into what might be called a production run on a plastic body sports car. K-F is negotiating with suppliers to furnish the bodies which will be assembled at the Willow Run plant with the initial schedule of 2000 units to start about next July. The car is designated only as the DKF-161, with the "D" presumably representing Howard Darrin, the stylist, and the "KF" for Kaiser-Frazer.

Details announced include a glass fiber-reinforced plastic body with doors that slide forward into the front quarter panels. Height to cowl will be 36 in., but road clearance will be standard. An all-weather sports top will disappear under the deck lid.

AND AVIATION INDUSTRIES

Another of Big Three Eyes Power Steering

Chevrolet will not have the only power steering option in the low-priced field for too long. One of its competitors is working on a power steering unit and will bring it out before the end of this year. It is believed the unit will not be the integral type currently used by Chevrolet, but will be a less expensive power assist unit which ties into the conventional steering linkage.

Saginaw Steering Gear Div. of GM is tooling for production of a linkage-booster type in addition to the integral type now used by GM. An advantage of the new design is that it is mounted under the car, freeing space in the engine compartment.

Monroe Auto Equipment Co. has announced development of a hydraulic power steering unit for passenger cars. The company says that it will be lower in cost than devices now in



ARMED TRAINER

Latest version of the Temco Buckaroo T-35 trainer and ground support plane will go to the Air Force for the MDAP program. Armament for target marking or ground support includes two Cal 30 machine guns, camera, ten 2.25-in. rockets.

use by the industry and that one manufacturer is definitely interested in it. The steering unit will supplement the Monroe line of shock absorbers.

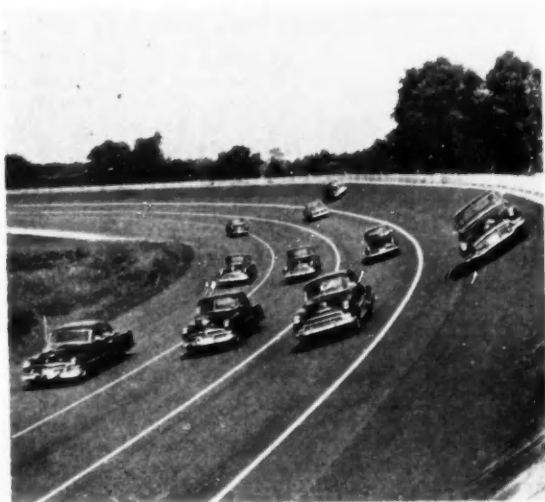
General Motors Tests Own, Rivals Cars in Torture Run

It would be interesting to compare results of General Motors' latest 25,000 mile endurance test of all makes of passenger cars with ratings given by various so-called testing experts. From time to time, publications, individual writers, or independent re-

search bureaus test various makes of cars and come up with what is presented as an authoritative evaluation, sometimes culminating in an award for the best performance, ride, operating economy, handling, or some other characteristic. The General

Motors test results naturally are closely guarded but, if made available, might shed considerable light on the accuracy of some of the foregoing individual testing procedures and results.

The GM 25,000 mile durability test was made at the GM proving ground near Detroit and involved 13 GM cars and 17 made by competitors. Cars are driven 25,000 miles (Con't on p. 140)



Ford Drops Cincinnati Plant Expansion

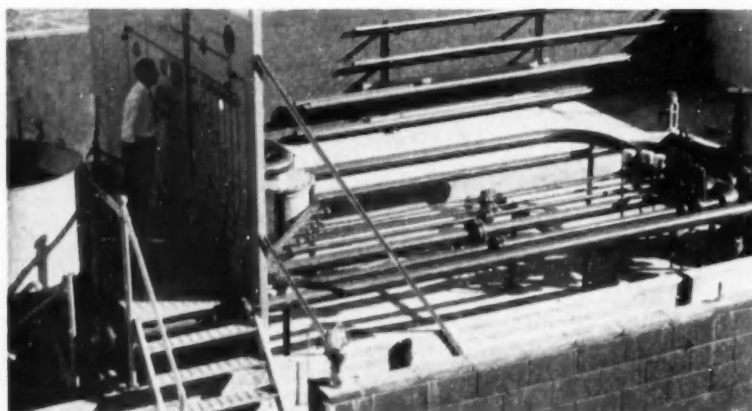
Ford Motor Co. has reversed its decision to build an additional \$15 million automatic transmission plant at Cincinnati, where it already has such a unit. Other facilities elsewhere have become available for expansion of automatic transmission production, and options on a plant site at Cincinnati have been dropped. The plant that had been proposed there would have had 350,000 sq ft of manufacturing space and a payroll of 2000 employees. Ford has not indicated where its additional automatic transmission facilities will be located but it is understood to be in the Detroit area.

S. F. Assembly Plant

Plans to build an assembly plant near San Francisco, Calif., have been revealed. The \$35 million facility will have over one million sq ft of floor space. When completed in two or three years the plant will probably eliminate the need for the Richmond plant in the same area. Present plans are understood to call for a capacity of 600 passenger cars and trucks daily on a two-shift basis.

Operations at the Long Beach Ford plant and the Los Angeles Mercury plant will not be affected by the expansion, a company spokesman said.

News of the AUTOMOTIVE



REFUELING TEST STAND

Development of high speed fueling components for aircraft will be speeded on this test facility at Parker Aircraft Co. A steel-reinforced concrete wall houses the test set, which is supplied with fuel by two centrifugal pumps powered with 40 hp and 50 hp motors. In addition to testing pressure fueling valves and equipment, airframe manufacturers can test entire plane sections with fuel systems in place.

1953 Model Changeover Cost \$500 Million

According to best estimates, it cost the automobile industry about one-half billion dollars to bring out 1953 models. General Motors alone spent \$300 million. Cost of complete change-over now is about three times that of prewar years, with the result that such changes now come at three year intervals, instead of two as formerly.

Ryerson Adds New Slitting Equipment at Los Angeles

A modern mill type slitter has recently been placed in operation at the Los Angeles, Calif., steel service plant of Joseph T. Ryerson & Son, Inc. The new slitting machine has a capacity for slitting strip of almost any width from sheet steel in coils to 48 in. wide and 3/16 in. thick. Slit coils can be furnished up to 15000 lb in weight.

The equipment consists of three units, a hydraulically operated uncoiler, the slitter itself on which circular knives are mounted and spaced as required, and a recoiler having a 20 in. diameter hydraulically operated reel.

With this new equipment, which supplements the firm's sheet shearing equipment for cutting flat stock to size, it is now possible to supply var-

ious coil sizes as well as straight lengths in types and tempers of sheet steel to customers' specifications. The pattern of sheet steel buying is said to be changing, with increasing tonnage being sold in slit coil form to satisfy the production needs of contract shops and manufacturers engaged in stamping, blanking and forming work.

Caterpillar Sales Hit Peak in 1952

Caterpillar Tractor Co. hit a new peak in sales last year, but earnings, while satisfactory, did not achieve the level reached in 1950. Sales last year exceeded \$477.5 million and earnings totaled more than \$22.1 million. Sales to the government exceeded \$56.3 million, representing about 12 per cent of the company's business in 1952. Export sales amounted to \$129.2 million, or 27 per cent of total sales. The company says that it could have built and sold an additional \$20 million more of its products last year if the steel strike had not curtailed production.

Holtite Office Moves

Continental Screw Co., New Bedford, Mass., announces a change in its Detroit address to 10428 W. McNichols Rd., Detroit 21.

Continental Sets Sales Record

Continental Motors Corp. ended its fiftieth year on Oct. 31, 1952 with record sales and working capital, and net earnings that have been exceeded only once previously. Sales to date in the first quarter of the 1953 fiscal year have exceeded those for the corresponding period a year ago.

Unfilled orders at the close of the 1952 fiscal year were substantially greater than a year ago.

Sales for the 1952 fiscal year totaled more than \$264 million compared with about \$166 million in 1951. Net earnings, after provision of \$14.9 million for income and excess profits taxes, amounted to \$6.13 million or \$1.85 per share of common stock. This compared with \$4.47 million, or \$1.35 per share, in the previous year.

The annual report states that several new engines were introduced during 1952 for agricultural, irrigation, aviation, industrial, transportation, marine and military use. It adds that important progress has been made in the development of a line of small gas turbines for military and commercial use, and that a subsidiary company, Continental Aviation and Engineering Corp., is to supply from this turbine line a model for use in a new twin-jet primary training plane to be built for the Air Force by Cessna Aircraft Corp.

Pressed Steel Gets New Order

Pressed Steel Car Co. has received a new contract from Army Ordnance for manufacture of shells, forgings, and lifting plugs. The amount of the order is reported at slightly more than \$9 million.

Willys Sales Show Gain

Willys-Overland Motors, Inc., reports a substantial increase in both sales and earnings for the three months ended last Dec. 31, the first quarter of its current fiscal year. Sales totaled more than \$94 million, a gain of 42.6 per cent over the same quarter a year earlier. Earnings before taxes totaled more than \$6.63 million, and in excess of \$2.12 million after taxes, a gain of about \$521,000.

AND AVIATION INDUSTRIES

U.S.S. Earnings Down; Record Quarter Shipment

Reporting on operations of United States Steel Corp. for the fourth quarter of 1952, income is given as \$48.1 million. Income for the year 1952 is reported as \$144.28 million, or a return of 4.6 per cent on sales, as compared with the income for the year 1951 of \$184.36 million, or a return of 5.2 per cent on sales.

Shipments of steel products in the fourth quarter of 1952 amounted to over 6.6 million net tons, the greatest tonnage shipped in any quarter in U. S. Steel's history. Shipments for the year, which were materially affected by the strike, totaled only 21.13 million net tons, which compares with the record tonnage of 24.62 million net tons shipped during 1951.

The latest step in simplifying the corporate structure was taken by merging U. S. Steel Co. into U. S. Steel Corp. at the end of 1952. This makes the corporation primarily an operating company for the first time in its history. It continues to own the capital stock of certain subsidiaries which are not engaged in producing or fabricating steel. This program of corporate simplification is designed to reduce costs, facilitate and improve production. It does not affect customer relationships or change the stock interest of stockholders.

Studebaker Price Cuts Larger than Increases

Studebaker has followed the general industry pricing pattern in connection with its 1953 models. Tags have been reduced on some models and increased slightly on others. Reductions range up to \$113, whereas largest increase is \$13.77. The cost of model changeover is estimated at about \$27 million, twice that of the previous complete change made in 1946.

Bendix Sales Up Nearly 50 Per Cent

Net sales of Bendix Aviation Corp. for the fiscal year ended Sept. 30, 1952, were \$508.7 million, compared with \$340.5 million in the previous year, according to the corporation's recent annual report. This represents a 49%

increase in sales, following a 55% increase the year before.

Net income also rose, to \$15.3 million or \$7.22 a common share, from \$11.8 million or \$5.58 a share in 1951, but at a smaller rate than sales. This was attributed to low margins on government business—79 per cent of sales, to price ceiling adjustments which lagged behind increases in costs of labor and materials, and to higher income taxes. At the end of the fiscal year the backlog of unfilled orders was \$721 million compared with \$698 million on the like date in 1951.

Gar Wood Sales Up, Earnings Down

Gar Wood Industries sales during 1952 amounted to \$55.9 million an increase of \$16.7 million over fiscal 1951. Net earnings totalled \$1.74 million or \$1.42 per common share, according to the company's 31st annual report just released. Earnings were about one-half those of last year, attributed to a change in inventory accounting.

During 1952, new lines of road machinery were introduced and improvements made in Gar Wood truck equipment. The company acquired 93 per cent of the outstanding stock of the United Stove Co., Ypsilanti, Mich.

Lear to Move Offices to California

Lear, Inc., manufacturer of automatic pilots and other electronic devices for the aviation industry, is planning to move its headquarters from Grand Rapids, Mich., to Santa Monica, Calif., about the middle of this year. Production facilities at Grand Rapids will continue to operate, however. The company is also planning to consolidate its California operations in a new plant at Santa Monica to cost about \$500,000 and to have 91,000 sq ft of floor space. Current California operations are now spread among 17 plants there.

North American Net Up

Net income of North American Aviation, Inc., for the fiscal year ended Sept. 30, 1952, amounted to \$7.82 million as compared with \$6.42 million in the previous year. Net sales for the year aggregated over \$315 million against \$177 million in the previous year, according to the annual report. An estimated backlog of \$1321 million and indications of further increases in sales during the next two years were also announced.

(Turn to page 142, please)

1953 U. S. PASSENGER CAR PRODUCTION

(As reported by the car factories)

	January 1953	December 1952	January 1952	Twelve Months*	
				1952	1951
Chrysler	16,684	17,826	10,407	129,678	163,525
De Soto	9,792	12,907	8,704	97,556	120,756
Dodge	31,263	37,735	21,991	259,519	321,655
Plymouth	49,844	64,915	34,764	474,636	622,601
Total—Chrysler Group	107,583	133,385	75,866	952,991*	1,228,536
Ford	79,050	91,994	18,273	771,331	900,770
Lincoln	3,883	3,131	892	31,992	25,386
Mercury	20,502	23,120	6,268	195,261	238,854
Total—Ford Group	103,435	118,245	25,433	998,784	1,165,010
Buick	38,191	19,780	25,854	321,048	404,695
Cadillac	9,311	6,135	6,028	96,851	103,272
Chevrolet	101,339	46,869	69,951	877,950	1,118,101
Oldsmobile	27,292	15,105	18,191	228,452	285,634
Pontiac	30,679	26,236	21,821	277,156	343,795
Total—G. M. Group	206,812	116,127	141,848	1,601,467	2,255,497
Kaiser-Frazer Group	3,039	8,062	4,131	74,862	99,339
Hudson	6,303	6,546	7,032	76,346	93,327
Nash	16,301	14,534	10,769	152,141	163,633
Packard	10,884	9,078	3,768	62,820	76,075
Studebaker	5,437	9,098	20,444	161,820	222,000
Willys	5,950	5,293	3,397	54,630	29,727
Total—All Makes	463,744	420,396	292,685	4,335,151*	5,333,144

* Revision of data shown January 15, 1953 issue on page 22

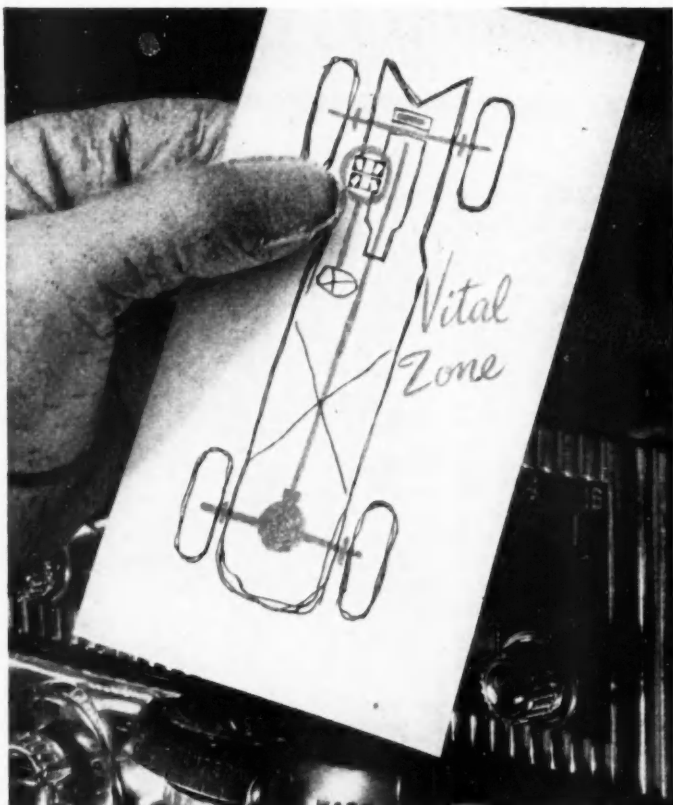
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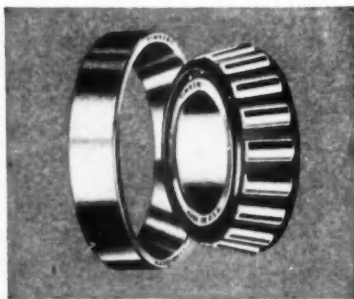
You can see that price is only *one* factor in value and must be weighed in relation to the factors *above* the line. Timken® bearings give you far more advantages above the line than any other tapered roller bearing. And in terms of value features, Timken bearing prices are lower today than ever. By this formula, or any other, your best value in tapered roller bearings is Timken. The Timken Roller Bearing Company, Canton 6, Ohio.



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Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers



Doman Helicopters, Inc.—John W. Mazur has joined the firm as chief design engineer.



Buick Motor Div.—Guy D. Briggs, Jr., was named plant manager of the Willow Springs, Ill., jet engine assembly plant, and Harold H. Miller was promoted to superintendent of the Buick foundry.



Firestone Tire & Rubber Co.—H. M. Taylor was elected vice-president for manufacturing sales.



GMC Truck & Coach Div.—Robert G. Dailey was named sales promotion manager of the truck division recently.



Kaiser-Frazer Corp.—Appointment of John V. Banks as vice-president in charge of manufacturing of the automotive division has been announced.



P. R. Mallory & Co.—George S. Bond has been promoted to sales manager of the metals and ceramics division.

B. F. Goodrich Co.—Arthur Kelly was named vice-president—manufacturing following the retirement of Thornton G. Graham on Jan. 31. Fred T. Marshall will be director, Federal Government relations in Washington.

Electro-Motive Div., General Motors Corp.—J. E. Hacker was recently promoted to works manager. Other changes included appointment of G. W. Elsey to the new post of manufacturing assistant to the general manager.



Link Aviation, Inc.—George Friedl, Jr., has been named work manager.
(Turn to page 134, please)

Superior Coach Corp.—James W. Wilt fills the newly-created position of director of advertising and sales promotion.

Chrysler Corp.—C. L. Horner was named supervisor of systems and procedures for the corporation. At Chrysler Div., Paul F. Lambert was promoted to general chief inspector of the Jefferson and Kercheval plants, and is succeeded as chief inspector of the Kercheval plant and car building division by William Lewis. Marshall Hughes was named general master mechanic for the two plants, while Walter Mathews succeeds Hughes as master mechanic at the Kercheval plant. New chief engineers for the DeSoto and Plymouth divisions are A. E. Kimberly and Robert Anderson.

Willys-Overland Motors, Inc.—John W. Snyder, former Secretary of the Treasury, was elected vice-president in charge of finance, a director and chairman of the finance committee. Gerry E. Lyons was elected vice-president in charge of sales, succeeding Howard P. Grove, who was elected vice-president in charge of West Coast distribution. George W. Ritter was elected vice-chairman of the board and re-elected executive vice-president.

Hudson Motor Car Co.—Will W. Sawdon has been appointed assistant general superintendent of the Wright Aeronautical manufacturing operations.

Ford Motor Co.—Election of Irving A. Duffy, vice-president—purchasing, as a board member and member of the executive committee has been announced.

Hydraulic Press Mfg. Co.—H. J. Zilske has been promoted to chief engineer of the hydraulic power division.

Mack Trucks, Inc.—W. Denis Kendall has been appointed vice-president of Mack Mfg. Corp., and is responsible for manufacturing at all Mack plants.

Boeing Airplane Co.—Lysle A. Wood, chief engineer, has been appointed to the newly-created post of director of pilotless aircraft.

Necrology

Vernon C. Genn, 59, general sales manager of the Detroit Diesel Engine Div., General Motors Corp., died in New York City, Jan. 30, while returning from a vacation trip.

William Grote, 85, chairman of the board of the Grote Mfg. Co. and of the Grotelite Co., died in Cincinnati, O., Jan. 16.

Thomas S. Green, 66, a former director of Norton Co., died Jan. 25 in Albany, N. Y.

George R. Weber, vice-president, treasurer and a director of Raybestos-Manhattan, Inc., died Jan. 14 at his home in Lancaster, Pa.

Arthur W. King, 69, industrial specialist for Briggs Mfg. Co. and a pioneer in the automobile industry in Detroit, died there on Jan. 18.

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Type I Firm	NC-711
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MIL-T-6841A	{DK-153
	{RK-304S
MIL-G-6747	DK-149

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See "Armstrong's Gasket Materials" in Sweet's file for product designers. For a personal copy of this manual, write to Armstrong Cork Co., Gaskets and Packings Dept., 1502 Arch St., Lancaster, Pa.



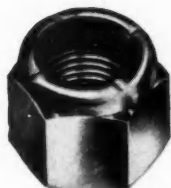
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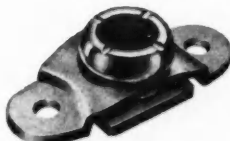
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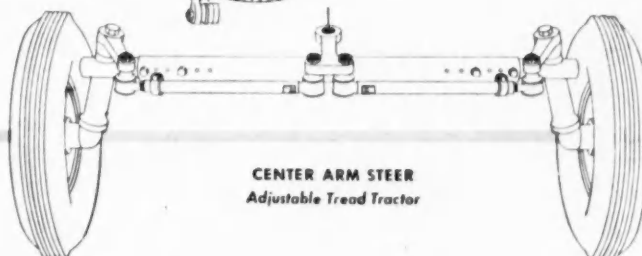
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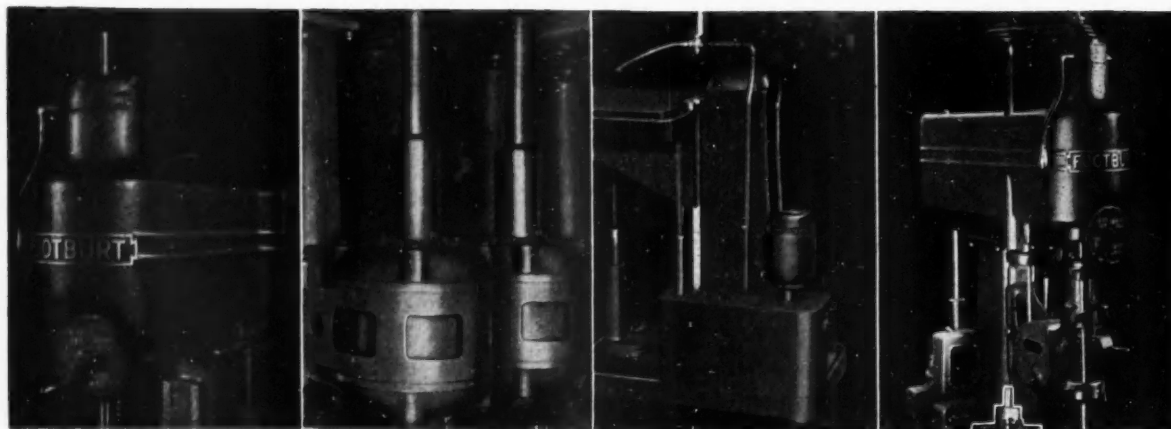
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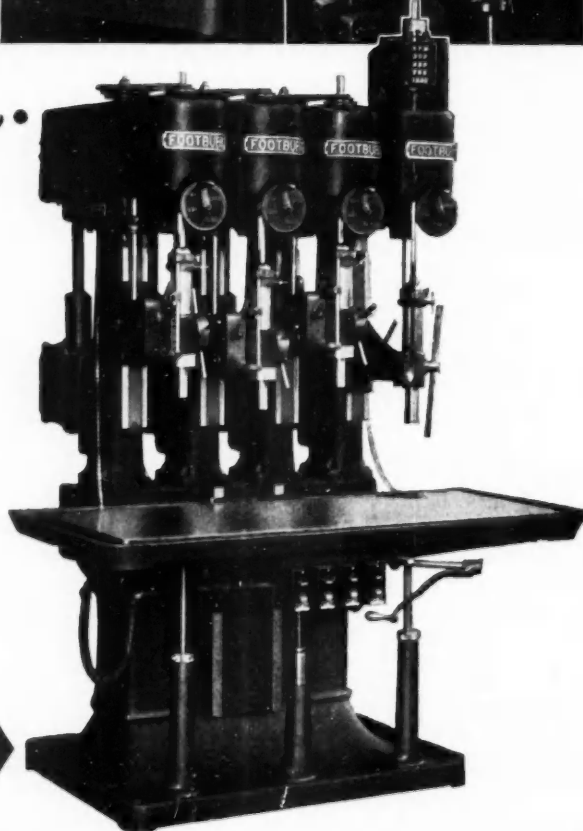


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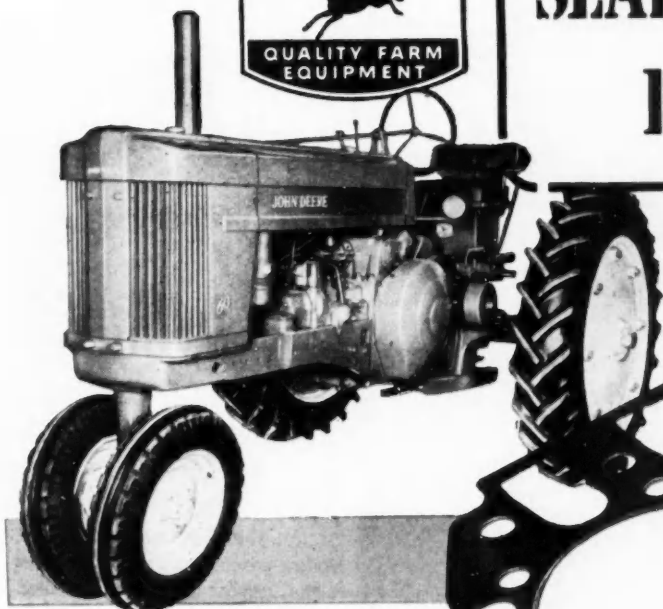
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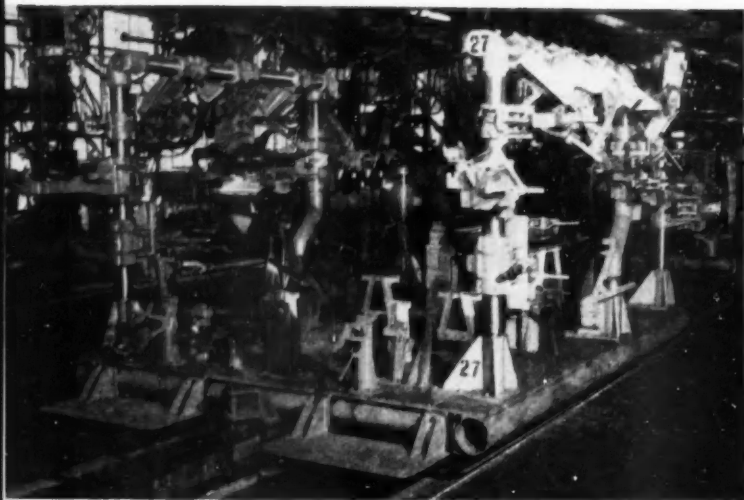
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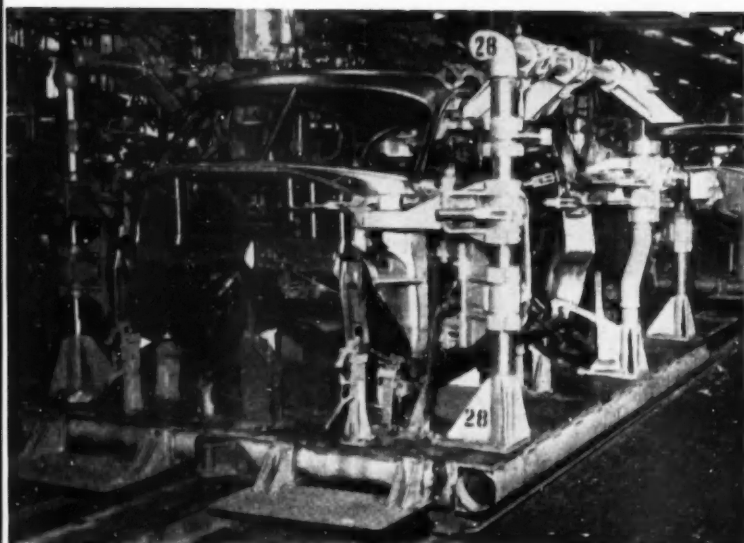
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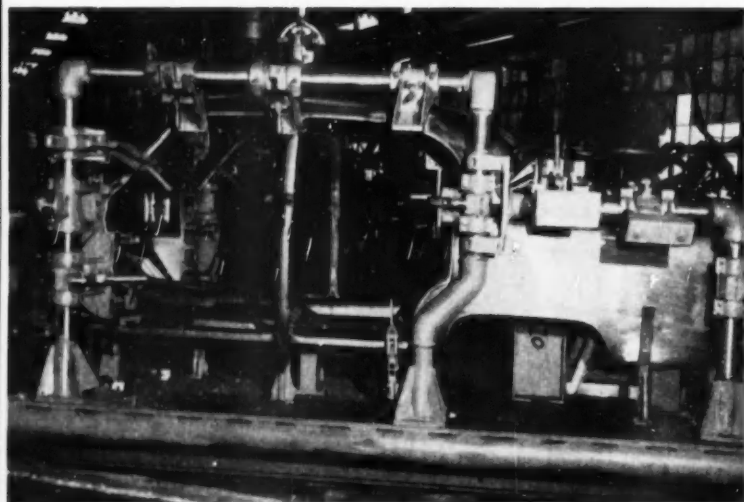


The multiplicity of equipment used to make up the body welding fixture is evident in this illustration at the loading station.



Front view of the body welding fixture on the merry-go-round conveyor.

Pictured here is a side view of the welding fixture and body components that traverse the multiple operation assembly line.



Latest Techniques in

By
Thomas MacNew

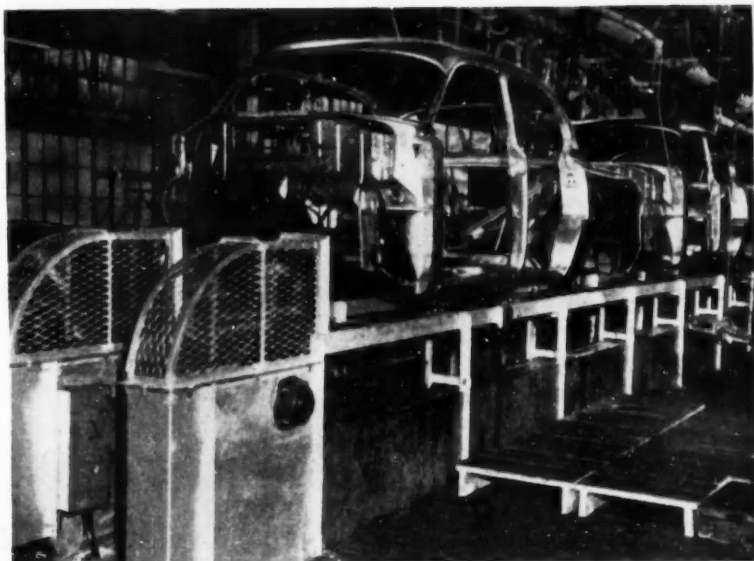
WITH the complete redesigning of the 1953 Dodge passenger car bodies, the Dodge Div. of Chrysler Corp. has installed an entirely new body assembly line in the main Dodge plant for making still better multi-welded bodies with a minimum of worker fatigue. This new line features four Dodge-engineered major assembly fixtures, equipped with the latest components, mounted on platforms and propelled around a large oval for operations on the top-side of the body.

Another innovation for Dodge is a table-height conveyor built especially for welding operations on the bottom of the body. The majority of the welding guns used throughout body-in-white assembly operations are of the hydraulic type, operating at 900 psi, and have been cleverly designed to make ordinarily hard-to-reach places readily accessible. To assure a high level of quality production, approximately 60 gages are utilized to check body dimensions during and after body assembly operations.

For the start of assembly operations on the four-door sedan, the front and center floor pan assembly is pinchwelded to the rear deck floor pan after clamping in a suitable fixture. This complete unit, which forms the underbody assembly, is then transferred to one of the merry-go-round assembly lines. At this point, the underbody assembly is placed in a loading stand, along with the right and left hand body side assemblies and the roof panel. Welding sealer is applied to the quarter panel flange at the roof joint before the roof panel is placed in the loading stand. These parts are next

Body Assembly

Bodies for 1953 Dodge Passenger Cars Are Built on a Completely New Assembly Line Especially Designed for Fast, Accurate Welding Operations.



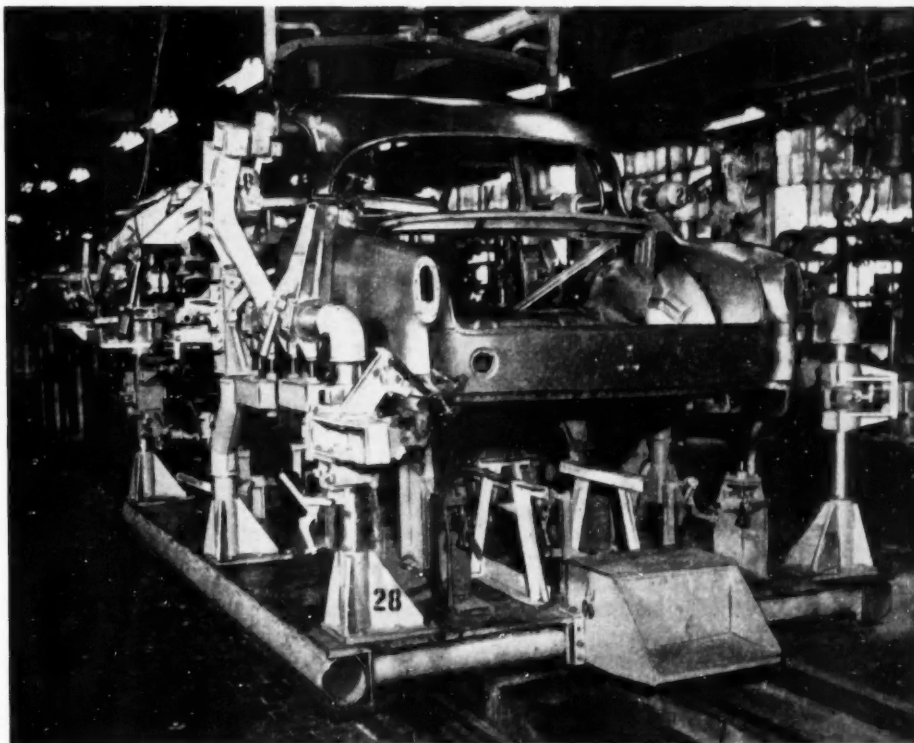
For welding operations on the bottom of the body, a table height conveyor has been built by Dodge engineers.

clamped together by means of quick acting or other special clamps so that the complete unit may be lifted, by means of an overhead hoist, to the major merry-go-round assembly fixture, which is attached to a bull ring conveyor.

The deck opening upper panel assembly is next clamped in the fixture along with the deck opening lower panel assembly. Welding operations are then carried out to join the side sill to the underbody at the door openings on both the right and left hand sides. Pinch welding is done also on body bolt reinforcements to the side sills.

Wheelhouse inner panels are next spot welded to the underbody and the floor pan side is tack welded to the floor pan. Another unit welded to the floor pan assembly at this point is the deck opening lower panel. The lower panel is then welded to the quarter panel at both the vertical and horizontal position on the right and left hand sides.

Next, the bottom flange of the filler neck shield for the gasoline tank and the deck lid lock catch support and brace are spot welded to the floor pan. Welding operations are then performed on the deck opening



Rear view of the welding fixture used on the conveyORIZED, merry-go-round type assembly line.

upper panel to join it to the quarter panel at the lap joint.

After assembling the cowl side panels on the right and left hand sides, the cowl flange is pinchwelded to the underbody. The cowl upper panel is welded to the side panel in a subsequent operation.

(Turn to page 96, please)

Current Automotive Activities

American Industry Dominates International Representation at Brussels Show

MANUFACTURERS and dealers shared Belgium's annual automobile show, held in the Centenary Palace, Brussels, from January 17 to 28, with the American industry dominating a complete international representation. Other nations represented were England, Germany, France, Italy, Czechoslovakia, Sweden and Russia. The show covered everything from lightweight motorcycles to the heaviest tractors and, with the exception of the two-wheelers, American makes had preponderance in all classes. The importance of this show was revealed by the presentation of the 1953 models of all American passenger car makers. Studebaker showed its new styles 10 days before they were revealed to the American public, and Packard sent over its Pan-American model.

Statistics show that Belgium's fleet of motor vehicles totals 471,892, of which 297,797 are passenger cars, 6247 are taxis, 2674 are buses, 151,480 are trucks, and 13,694 are various types of tax-free automobiles. The average age is much lower than in most European countries, for more than 80 per cent of the passenger cars and nearly 70 per cent of the trucks have been in service less than five years. Last year's imports into Belgium totalled 71,326 passenger cars and 20,517 trucks, the United States being at the head of the list with 24,572 passenger cars and 10,470 trucks, followed in passenger car imports by Germany, Great Britain, France and Italy. In the truck division the United States was followed by Great Britain, Germany and France. In this connection it can be noted that U.S.S.R. supplied 418 passenger cars, compared with 547 in 1951.

There is a government project which would require complete assembly of vehicles in Belgium from January 1, 1954. This would not affect American interests, for last year, out of a total of 24,572 American passenger cars only 614 were imported complete; and 180 complete trucks out of a total of 10,470. Practically every American maker has his own assembly plant in Belgium, to which are imported units such as engines, transmissions, axles, and frames, which are assembled

and finished by Belgian labor, and equipped with such Belgian components as tires, batteries, upholstery, trim, paint, wiring, etc. In many cases Belgium is used as an export center to such countries as Switzerland, France, Holland, Turkey, etc. Where big production is concerned, there is every advantage in importing knocked-down vehicles, for parts pay only 10 per cent import duty, compared with 24 per cent on a complete vehicle.

European countries, headed by Great Britain and followed by France, Italy and Germany, have protested against the proposed obligation to assemble locally and have succeeded in holding back the projected law. England assembled nearly 50 per cent of her total imports, France assembled 70 per cent of her passenger cars, Italy assembled only 0.7 per cent of her total, and Germany three per cent. Assembly is compatible only with big output, as it is practically impossible for makers of high grade custom cars to deliver anything but complete vehicles. It is claimed, however, that these are mostly expensive vehicles which can bear increased import duties. The government holds the whip hand as it can refuse to grant import licenses unless automobiles are assembled locally. The English appear to be the strongest opponents of the assembly scheme. Austin and Morris deliver only complete vehicles. Standard has an assembly plant. Citroen and Renault assemble nearly all their models. At present Germany is doing little assembly, but is expected to increase shortly. Italy also is low on assembly and, in the case of specialized makers of sports cars, it is practically impossible to deliver anything but complete vehicles.

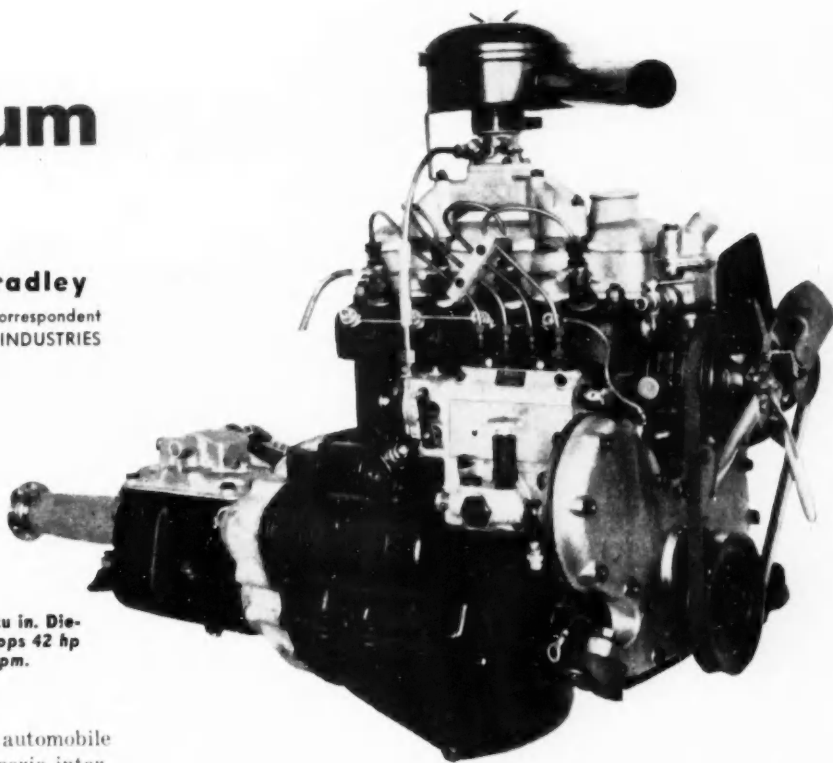
In the truck line there is a considerable amount of integration, the old-established Belgian makers producing vehicles carrying their own name, but built up to a considerable extent of parts from America, England and Germany.

Technically the show failed to reveal anything new of outstanding merit. An attempt is being made to bring the Minerva Co. forward as a manufacturing organization. It is one of the oldest and was at one

in Belgium

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES



Borgward 110 cu in. Diesel which develops 42 hp at 3400 rpm.

time the largest of Belgian automobile companies. Minerva and Imperia interests now are in the hands of M. Van Roggen. At the end of 1944 and until 1947, the plants were occupied by the British Army motor transport repair department. For about a year Humber and Hillman automobiles were assembled, then a contract was obtained for the assembly of the English Land Rover for the Belgian army. About 5000 of these have been delivered and 2500 are yet to be supplied. Arrangements have just been completed for Minerva to take up the English Armstrong Siddeley Sapphire model. This was on display. At first it will be imported complete; then a new body complying with Continental ideas will be produced, and assembly will begin on an increasing scale until about 70 per cent of the car is Belgian. It will be marketed and exported under the Minerva name.

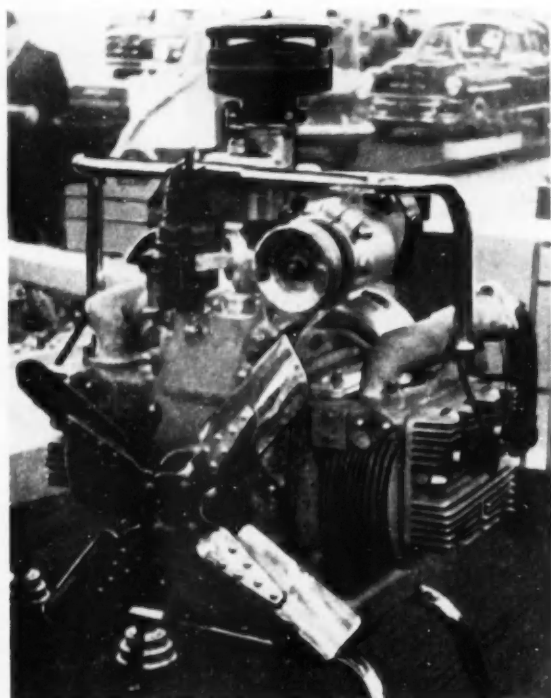
In addition, Van Roggen has purchased the automobile rights of the bankrupt Italian Caproni Co., including the plans of the car designed by Engineer Fessia and presented to the public for the first time at the Paris show of 1947. With the exception of about 20 prototype models, this car never went into production. Minerva displayed a chassis that appeared to be the one which appeared in Paris more than five years ago. It is featured by a full-width platform frame with a narrow forward extension on which a flat-four, water-



Siata sports coupe built on Fiat chassis with Fiat 1400 engine.



New Borgward-Hansa 2400. It is powered by a six-cylinder, 146 cu in., overhead-valve engine, and has independent suspension front and rear.



Minerva 91 cu in. aircooled, four-cylinder engine. This engine was designed to replace the watercooled unit now used in the Minerva chassis.

cooled engine is mounted, with drive to the front wheels. The chassis is similarly narrowed at the rear to receive the independently sprung wheels. Minerva interests stated that while the Caproni chassis will be maintained, the watercooled engine will be replaced by a flat-four, aircooled model of 91½ cu in. which was on display. This is an L-head type, with its crankshaft carried on taper roller bearings, a dual Solex carburetor, and all the accessories mounted on the top of the engine. No transmission was shown, but it was stated that an automatic type had been designed and would be used. As little development work has been done, it is obvious that this car is not likely to get into production in the immediate future.

An entirely new model was the Marathon light car produced in Holland and intended to be assembled in Belgium very shortly. This enters into the sporting cyclecar class, and is powered by a twin-cylinder Zundopp motorcycle engine which develops 26 hp. The transmission, however, is not used on the motorcycle. It has unit construction of body and frame with the engine mounted at the rear, and independent suspension all round by means of rubber blocks under torsion. Curb weight is only 1100 lb.

In line with a movement which originated in France, the Ford Taunus model was shown without any frills, and with a price reduction of \$160 on the standard model. This saving has been attained by a complete elimination of chromium plating—even the bumpers

being painted—by lower-priced upholstery and simplified seats, and by the return of a central gearshift lever.

A new Diesel-engined passenger car was shown by Borgward. With a piston displacement of 110 cu in., the Borgward engine develops 42 hp at 3400 rpm. It is a valve-in-head type with Bosch injection equipment, and is interchangeable with the gasoline engine. The only other passenger car with a Diesel engine was the Mercedes 170D, which has been on the market for some time. It has a piston displacement of 108 cu in. In the truck section Fiat showed a four cylinder Diesel of only 116 cu in., developing 40 hp at 3200 rpm. This is used in a truck chassis having a load capacity of 2500 lb.

Direct fuel injection, under the Bosch system, was used on the Goliath GP 700, produced by the Borgward Group. This injection system was introduced a year ago, but Goliath appears, so far, to have been the only firm putting it into production on its vertical two-cylinder water-cooled front-wheel drive model of 42.7 cu in. piston displacement. With direct injection the output is boosted to 29 hp, compared with 25.5 hp for the same engine with carburetor equipment.

For the first time since putting it on the market, Citroen revealed the mechanical construction of its front-wheel drive, low priced, four-passenger car, with an aircooled engine of only 22.8 cu in. piston displacement. This is the simplest and one of the most original cars on the European market, and is being produced at the rate of 140 per day at the Paris factory. As this is quite insufficient to meet requirements, it is only gradually being introduced to foreign markets. Citroen's intention is to assemble the small car in Belgium, as is already done for the two full-sized automobiles.

Russia's contribution was the Moskvitch with a four-cylinder, L-head engine of 65.5 cu in. piston displacement developing 24 hp at 3600 rpm. It has a unit body and frame, and Dubonnet suspension. This car, in reality, is the pre-war Opel Kadett, the only difference being the use of a synchromesh three-speed transmission. Last year 418 of these cars were imported, compared with 547 a year earlier.

From the Russian zone of Germany came the two IFA models, one of them powered by a two-cylinder, two-stroke, 42 cu in. engine, and the other by a three-cylinder, two-stroke, 55 cu in. engine. Built in the ex-Auto Union factory at Chemnitz, these are practically the same as the pre-war D.K.W. models, and feature transverse engine mountings with front wheel drive for the twin cylinder, and longitudinal mounting with front drive for the three-cylinder power plant. The B.M.W., also produced in the Russian zone, was not displayed, but arrangements are being completed for it to be assembled in Belgium and equipped with a locally-built body.

American makers occupied a large share of the space in the truck section at Brussels. For the first time in Europe, Ford showed the Cargo King series of valve-in-head V-eights, of 145 and 155 hp. General Motors

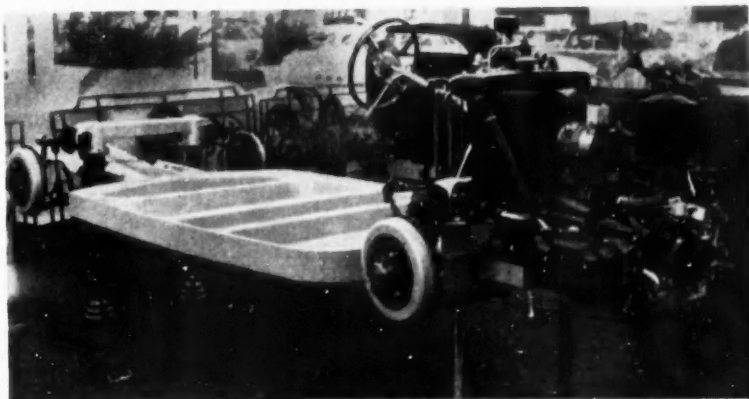
showed not only the American vehicles but those built at Luton by the Bedford Co., notably the latest 4 x 4 supplied to the British army and now being assembled in the Belgian factory.

Practically no commercial vehicle is entirely of Belgian origin, but there is such an intermingling of parts that it is difficult to determine the original nationality. Metallurgique is linked up with English Leyland, but also produces the Marmon-Herrington bus with either the Leyland horizontal or the Bussing horizontal engine. Entente Inter Construction groups the Belgian firms of F.N., Brossel, Bovy and Pipe. A complete engine is built by F.N., but the range of vehicles is composed of various assemblies from America and England. While British firms were less numerous than last year, German makers were stronger, with a very broad range of types, in which the Diesel was supreme. Despite the fact that the Belgian market is saturated with American trucks, mostly of the gasoline engine type, the growth of the heavy oil engine has been remarkable during the last three years. In 1948 the number of Diesels was 2902, increasing to 3822 the following year and 5597 in 1951. The figures for 1952 are not yet announced, but it is known that the growth has continued. This year, for the first time, the small high-speed Diesel, of 122 cu in. or less, made its appearance, with models from Fiat, Perkins, and Borgward. The horizontal engine is increasing for bus service, but Renault is the only one adopting this layout for truck service. Daimler-Benz showed a rear transverse mounting of a 145 hp, six-cylinder Diesel, with a ZF six-speed electrically controlled transmission, on a 67 passenger Pullman bus chassis.

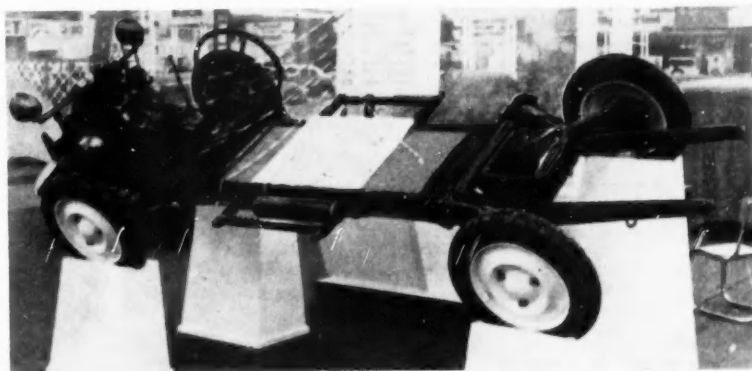
In the motorcycle section the outstanding feature was the rapid growth of the scooter. Originating in Italy, this type of machine is now being produced by practically all European makers with the exception of those in England, where hesitation is being displayed.

In the passenger car class, Renault was the lowest priced with its four-passenger, rear engine car, followed by Citroen and the Russian Moskovitch. Following are some of the prices in Belgian francs, above:

Renault, 4 hp	49,500
Citroen, 2 hp	50,000
Moskovitch	53,000
I.F.A. 690 cc.	57,500
Morris Minor	64,900
I.F.A. 900	69,500
Wolkswagen	69,000
Ford Taunus	77,000
Triumph Mayflower	74,000
Open Olympia	74,500
Hillman Minx	79,500
Citroen 11 L	83,250
Skoda	83,400
Austin A 40	83,900
Morris Oxford	86,900
Ford Consul	87,500
Peugeot	88,100
Simca	89,900



Chassis for Minerva front-drive car. All wheels are independently suspended, and the rear coil springs are enclosed in vertical housings. The four-cylinder, 76 cu in. engine is water-cooled.



Chassis of the Citroen two-cylinder, four-passenger car. This was the first exhibition of the Citroen chassis.

Russian Tractors or Potential War Machines?



The KT-12, which weighs 13,000 lb and has a drawbar pull of 6800 lb, is used for logging and also is designed for conversion to military application

CRAWLERS accounted for two-thirds of all the Russian tractors produced in 1938, and there are indications that this proportion may have risen to three-quarters by now. There are several possible reasons for this emphasis on tracklayers rather than on wheeled varieties: their suitability for road, construction and lumbering work as well as for agriculture; the size of the Russian farms and the widespread use of heavy implements; and the concentration of tractors in State-owned or collective machine stations which provide facilities for the more difficult maintenance of this type.

The high efficiency of the Diesel-powered

crawler is another factor, particularly in view of the intensive utilization obtaining in the USSR. Before the war the Ministry of Agriculture claimed that tractor utilization on Russian collective farms had reached 2500 hours per year—an average of 48 hours per week.

Soviet production in 1950 was 117,000 tractors of



This S-80 crawler is fitted with a T-107 loader having a bucket capacity of five to seven cu yd.

The name of the author of this article has been withheld to protect the sources since material in it was obtained from behind the Iron Curtain.

all kinds, calculating from the official percentage increase over 1940. The total stock of tractors in the country in 1950 has been estimated by the U N Economic Commission for Europe at 564,000 units. These figures do not include self-propelled farm machines such as cotton pickers, combines and cultivators, and the increased introduction of such equipment may partly account for the decreasing proportion of all-purpose wheeled tractors in the total output.

The range of models currently being manufactured is limited to relatively few types, with the widely-dispersed factories specializing in one or two varieties. Diesel engines are used in all but a few of these, due to the greater economy and availability of Diesel fuel. Kerosene is probably the most important fuel. In addition, a few gasoline-driven wheeled tractors are used, some of which are convertible for burning solid fuels (gasogenes). Cable-operated electric tractors are employed or planned in areas adjacent to hydro-electric stations (see photo, page 42).

The design of Soviet tractors often follows the U. S. models, since thousands of these were imported before the USSR developed its own industry. From 1921 to 1931 Russia imported 90,000 tractors, practically all of which were American. Very few were purchased from abroad after this until the war years, during which 10,000 came from the U. S.

The S-80 crawler is best known for being a virtual replica of the Caterpillar D-7. This went into production in 1946 at the Chelyabinsk Tractor Plant in the Urals, and is powered with a four-stroke, four-cyl Diesel of 827 cu in. piston displacement which develops 93 bhp at 1100 rpm. Drawbar rating is 80 hp. The S-80 is also produced as a bulldozer, designated as Model D-157, and as a front end loader. It can be fitted with a rear-mounted three-drum winch.

Another of the larger Diesels is the DT-54 made in Kharkov. With a drawbar hp of 40, it has a four-cyl, water-cooled engine rated at 54 bhp at 1300 rpm. Like all the newer Russian crawlers, this has a fully-enclosed cab.

A smaller tracklayer is the KD-35, first manufac-

SOVIET AIMS

It is customary in Europe to develop commercial vehicles so that they and their designs can be adapted to military use in case of war. Russian crawler tractors are in this category. The principal reason for producing such a large proportion of crawlers in Russia today is the possibility, as anticipated in the current Soviet mobilization plans, of their requisition by the armed forces for engineer troops and for artillery prime movers, according to Demitri B. Shimkin, of the Russian Research Center at Harvard University, who is consultant to AUTOMOTIVE INDUSTRIES on Russian Industrial Affairs.

An example of military application is the KT-12 crawler illustrated in this article, which also is the chassis for the SU 76 self-propelled gun. Another example is the use of Russian S-80 crawler tractors in the Korean war. Furthermore, factories making crawlers are more easily converted to armored vehicle production.

In reviewing this article, Dr. Shimkin has provided the following interesting comments. The figure of 117,000 units for 1950 production must be taken with caution, although it is based on official data. It unquestionably includes tractor-equivalents in spare parts. The more generally accepted figure is 93,000 to 96,000.

While tractor production as a whole slightly exceeded its goal by 1950, the input of tractors into agriculture was only 74 per cent of plan, from official data. For the 1946-50 period, agriculture was to receive 325,000 units, or 725,000 so-called "15 hp equivalents." Actual deliveries, according to the official report of April, 1951, were only 536,000 "15 hp equivalents" for the entire period. Furthermore, the 62,000 tractors received by agriculture in 1951 were 24 per cent less than in 1950.

The total figure of 560,000 tractors in Soviet agriculture in 1950 appears about right. However, it should be noted that this figure is only 30,000 higher than that for 1940. At the same time, the number of horses fell over this period from 21 to 13 million head, so that the problem of power in Soviet agriculture today is very acute.

The goals of the Fifth Five-Year Plan for tractor production are very modest, calling for only a 20 per cent increase between 1950 and 1955, or some 114,000 units (140,000 including spare parts equivalents) in the terminal year.

The author very properly emphasizes the American ancestry of the Russian tractors. Also the chronology of the models may be of interest: most of those in operation are of a wheeled type not produced since 1937, namely SKhTZ 15/30. The crawler tractors S60 and S65 (Chelyabinsk), produced up to 1941, are also fairly common. As stated, U2 is a model originally dating to 1930, when it was produced at the Krasnyl Putilovets factory in Leningrad. The crawler STZ-NATI was produced at Kharkov and Stalingrad after 1937. During and since the war it was manufactured at the Rubtsovsk factory in Western Siberia (evacuated Kharkov equipment). In 1950 it was being made at all these plants. Models introduced between 1946 and 1948 are the S-80 and KD-35, between 1948 and 1950, KhTZ-7 and DT-54; and since 1950, the MTZ.

The accompanying tables of Russian tractor specifications and tractor plant data were prepared by Dr. Shimkin.—Ed.

Russian Tractors . . .

Specifications of Current Soviet Tractors

Type	MODEL					
	U2 Wheeled	STZ-NATI Crawler	S80 Crawler	KD35 Crawler	KhTZ-7 Wheeled	DT-54 Crawler
Dimensions:						
Length (in.)	131	145.5	166.5	119.4	.....	.....
Width (in.)	65	73.3	96.7	56.3	.....	.....
Height (in.)	61	62	109	54.8	.....	.....
Weight, working (lb)	4510	1125	25,000	8475	.....	11,900
Engine	4-stroke kerosene	4-stroke kerosene	4-stroke Diesel	4-stroke Diesel	gasoline	Diesel
Number of cylinders	4	4	4	4	.....	.....
Cylinder diameter (in.)	3.74	4.92	5.71	3.94	.....	.....
Stroke (in.)	5.0	5.99	8.07	5.12	.....	.....
Piston displacement (cu in.)	218	455	827	249	.....	.....
Compression ratio (to 1)	4.1	4.0	15.5	17.0	.....	.....
Maximum hp	22	52	93	37	12	54
Rpm	1200	1250	1000	1400	1600	1300
Fuel system	gravity	gravity	pump	pump	.....	.....
Ignition	magneto	magneto	compression	compression	.....	.....
Lubrication	splash	combined	combined	pressure	.....	.....
Capacity (qt)	8	19	28.5	16	.....	.....
Cooling	thermo-siphon	forced	forced	forced	.....	.....
Capacity (gal)	7.2	14.5	16.9	9.5	.....	.....
Starting	manual	manual	two-cyl, 2-stroke engine	one-cyl, 2-stroke engine	.....	.....
Transmissions:						
Gear box ratios —						
First	36/16	48/15	2.54	2.39	.....	.....
Second	32/20	46/17	1.58	1.96	.....	.....
Third	27/25	44/19	1.12	1.75	.....	.....
Fourth	.....	38/25	0.77	1.49	.....	.....
Fifth	.....	.....	0.59	direct	.....	.....

tured in the latter half of 1948, and now being produced in both Stalingrad and Lipetsk. The power unit is a four-stroke, four-cyl Diesel engine developing 37 bhp with 24 hp at the drawbar. There are five forward speeds and one reverse, and the maximum

speed is stated to be 5½ mph. Fuel tank capacity is 25 gallons.

One Soviet crawler intended especially for timber work is the KT-12. Weighing 13,000 lb, it has a drawbar pull of 6800 lb and a five-speed transmission with top speed stated to be 7½ mph. Solid fuel—particularly locally-procured wood—is used with the generator mounted on the right behind the cab. The track is designed to give maximum traction on ice or timber.

A large apron at the rear of the KT-12 is lowered to the position of a ramp during loading, with a winch dragging the butts of the logs onto it. When the logs are secured to it with chains, the apron is drawn by the winch up onto the tractor chassis. There is also an electric version of this crawler, the ETT-1. Including the power cable, this weighs 3500 lb more than the KT-12 and has almost twice the drawbar pull in each gear.

A new East German crawler, designated as KS 06, features a track made

Soviet Tractor Plants (1950)

Factory	Began Operation (year)	Models in Production 1950
Stalingrad	1929	STZ-NATI
Chelyabinsk (Kirov factory)	1933	DT-54, (KD-35-)
Karkov	1931*	S-80
		KhTZ-7
		STZ-NATI
		DT-54
Rubtsovsk (Altai)	(1944)	STZ-NATI
		DT-54
Vladimir	(1946)	U2
Lipetsk	(1948)	KD35
Minsk	(1950)	MTZ

* Restored postwar.



The MTZ-2 is a late model which went into production at the Minsk tractor plant last year. Its Diesel engine develops 37 hp at 1400 rpm.



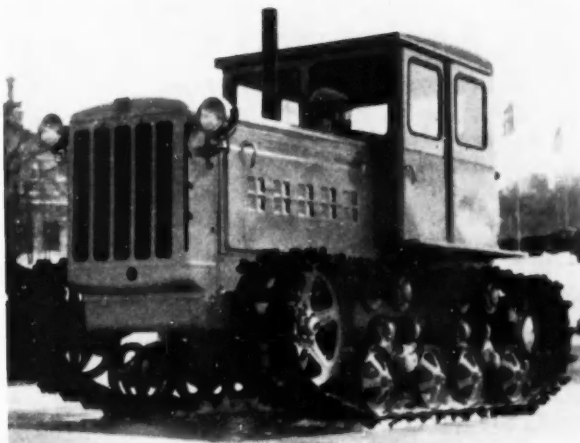
A 37-hp, four-cyl Diesel powers this KD-35 crawler. It was brought out during the latter part of 1948, and now is being made in Stalingrad and Lipetsk.

entirely of rubber-impregnated perlon. This locally-produced synthetic fiber is used for both the belt and the flat, abutting lugs. The only metal parts are the two bolts and brackets securing each lug. A saving of 3700 lb weight (and scarce steel) is claimed. The tractor is powered by a three-cyl two-stroke Diesel developing 60 to 80 hp at 1500 rpm. Eight forward speeds are available—the top one providing some 10 mph—and the weight is 3.8 tons.

Two new Russian wheeled tractors were put into production in 1952. The MTZ-2, which weighs 7150 lb, is powered by a four-cyl, four-stroke Diesel developing 37 hp at 1400 rpm. It has five forward ratios and one reverse maximum speed being eight mph. Drawbar pull in second gear is 3000 lb and rating is 24 hp.

Treads may be varied from 48 in. to 72 in., with the front axle adjustable and the rear wheels shifted on splined shafts. When narrow gage front wheels are fitted, giving a 7½ in. tread, this machine is indicated as MTZ-1. These models are made in Minsk.

A smaller four-wheeler is the XTZ-7, produced in Kharkov. This has a 12 bhp, 1600 rpm gasoline engine, developing 8½ hp at the drawbar and a pull of 1300 lb. There is a four-speed reversible transmission, top speed being 7.7 mph in



The DT-54 crawler, produced at the Kharkov tractor plant, has a four-cyl engine which develops 54 bhp at 1300 rpm.



For use with rear-mounted implements, the driver's seat and steering column of this XTZ-7 gasoline-engine powered tractor may be swung around to face backwards.

Russian Tractors . .



Soviet S-80 crawler and D-222 scraper. Capacity of the scraper is about seven cu yd.

either direction. An additional forward low gear makes possible creeping at 0.45 mph.

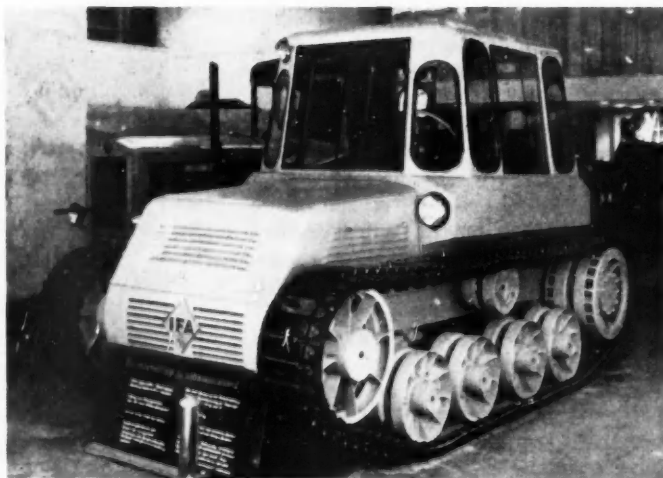
The use of rear-mounted implements is facilitated by enabling the driver to face backwards; the bench-type upholstered seat can be swung around the vertical steering column and the centrally-located controls. The XTZ-7 is designed for orchard as well as row crop work and can be adapted for either by altering the front axle height. The front steering knuckles may be reversed on their brackets by removing four bolts. In the low position overall height is only 44 in. and ground clearance is 12½ in., while in the high position the clearance is raised to 21 in.

Variable-width axles permit treads of 40 in. to 60 in. The combined hood and grill assembly is hinged at the rear, folding back across the fuel tank to give wide access to the engine. Both the XTZ-7 and the MTZ tractors have separate wheel brakes, belt drive and hydraulic implement control, and are available with either balloon tires or steel wheels.

These two machines of modern design are in marked contrast to the Soviet "Universal" Model U-12 which is understood to be built in production at the Vladimir Tractor Works. This metal-wheeled row crop tractor appears to be based on the American International of perhaps 1925 vintage, and is believed to have been first made in the USSR in the early 1930's. It is powered with a four-cyl, carburetor-type engine running on kerosene, with gasoline for starting.



Russian electric crawler tractors on a collective farm. They have built-in drums for taking in or letting out the cables and are used mainly in the vicinity of the new hydroelectric stations on the Volga, Don, Dnieper and Amu Darya Rivers.



New East German crawler, the KS-06, which has tracks of rubber-impregnated synthetic fiber.

New Waukesha Diesels

Equipped with Turbo-Superchargers

ILLUSTRATED here are three new six-cylinder Waukesha Diesel engines equipped with turbosuperchargers. The exhaust turbocharger system of supercharging is said to afford a large increase in power with a minimum of parasite load. For instance, even without an intercooler, maximum power available from the Model 135-DKB Diesel engine is increased from 146 hp to 185 hp at 2800 rpm when a turbosupercharger is added. Without positive drive from the engine, the parasitic load decreases at part engine load, which improves over-all fuel economy throughout the speed range.

Other advantages claimed for the exhaust turbocharger are: a relatively light and compact installation; flexibility in mounting; and the elimination of mufflers on most installations due to the smoothing out of the exhaust impulses by the turbocharger turbine.

In addition to the three models shown, Waukesha has brought out two other new six-cylinder turbosupercharged Diesels; the 148-DKBS and the NKDS. Maximum horsepower of the 148-DKBS is 280 at 2100 rpm. It has a bore of 5.25 in., stroke of 6 in., and piston displacement of 779 cu in. The NKDS develops 341 hp at 1050 rpm or, with counterbalanced crankshaft, 380 hp at 1200 rpm. Its bore is 7 in., stroke 8.25 in., and piston displacement 1905 cu in.

TOP—

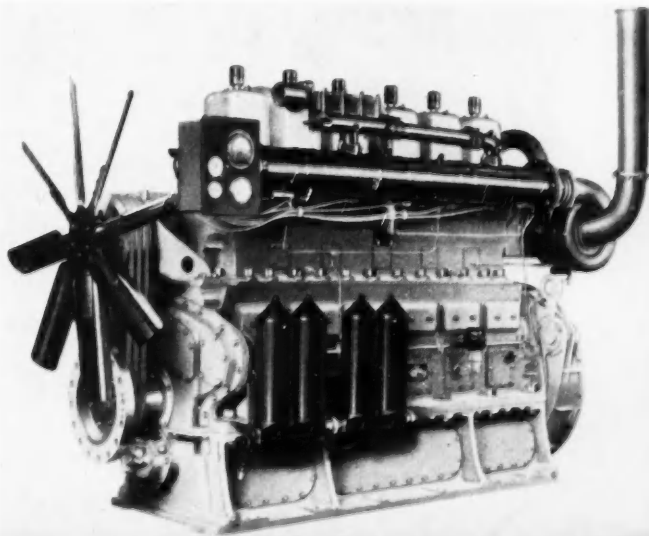
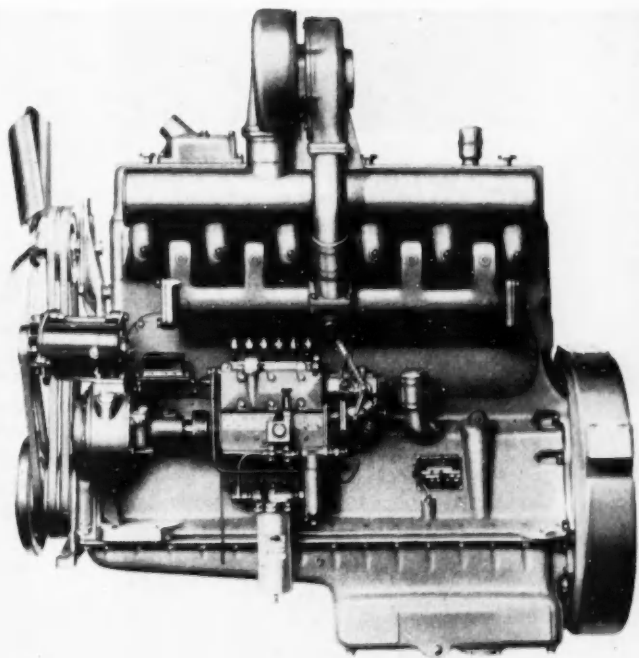
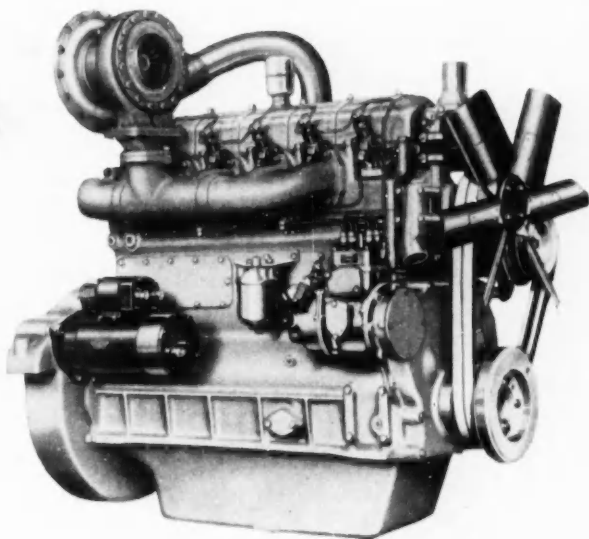
Model 135-DKBS Diesel equipped with Schwitzer-Cummins turbo-supercharger. Bore is 4.25 in., stroke 5 in., and piston displacement is 426 cu in. Maximum output is 185 hp at 2800 rpm.

MIDDLE—

An Elliot turbosupercharger is used on this Model LRDS which develops a maximum of 570 hp at 1200 rpm with counterbalanced crankshaft and vibration damper. Bore is 8.5 in., stroke 8.5 in., and piston displacement is 2894 cu in. Maximum torque is 2545 lb ft at 1000 rpm.

BOTTOM—

Peak output of the Model WAKDS is 352 hp at 1800 rpm with counterbalanced crankshaft. Its maximum torque is 1062 lb ft at 1600 rpm. Bore and stroke are 6.25 by 6.5 in., and piston displacement is 1197 cu in. The turbosupercharger is an Elliot.





Robert Cass, White Motor Co., elected president of the Society of Automotive Engineers for 1953.



L. F. Dumont, E. I. du Pont de Nemours & Co., is the winner of the 1951 SAE Horning Memorial Award.

Fallacies of Social Engineering

Admiral Ben Moreell of Jones & Laughlin Steel Corp., Addresses Annual SAE Meeting in Detroit. Large Attendance at Technical Sessions

By James R. Custer

SCIENTIFIC engineers are guided by the unchanging laws of chemistry, physics, and those of other natural sciences. On the other hand social engineers "either know nothing of nature's immutable laws, or choose to ignore them. Instead they have their man-made and variable laws of compulsion, prohibitions, and other restrictions on the free actions of individuals."

These precepts were the basis of an impressive address by Admiral Ben Moreell, chairman of the board, Jones & Laughlin Steel Corp., at the annual meeting of the Society of Automotive Engineers last month in Detroit. Social engineering is replete with fallacies, the speaker stated in his analysis. He defined social engineers as those who are dedicated to the thesis that, by using the force of government, mankind in mass can be changed and molded to conform to a master plan. The major fallacy of all these schemes is that they deny to people their freedom of choice.

Of the Tennessee Valley Authority, to which a "social engineer in charge" referred as "a seamless web—the unity of land and water and men," Admiral Moreell asked why additional appropriations must be sought from Congress almost every year even though they call it a "financial success." He also asked why stock for it is not offered on the open market where people can have a free choice. His answer was that the people would reject it.

In the foreign field he labelled Stalin and Hitler social engineers. Hitler, he said, looked upon people as clay to be molded to his purpose, but some of this clay—human beings—did not meet his specifications and he destroyed them much in the same manner that a scientific engineer discards defective material. In his social reform program Hitler allowed little freedom of choice, but instead used the force of government to regulate wages, prices, profits, working conditions, unions, rents, housing, edu-

SAE Officers for 1953

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Robert Cass, White Motor Co.

Treasurer

B. B. Bachman, Autocar Co.

Vice Presidents

Air Transport—O. E. Kirchner, American Air Lines, Inc.

Aircraft—T. T. Neill, National Advisory Committee for Aeronautics

Aircraft Powerplant—E. G. Haven, General Electric Co.

Body—H. E. Chesebrough, Chrysler Corp.

Diesel Engine—J. W. Pennington, Koppers Co., Inc.

Engineering Materials—G. C. Riegel, Caterpillar Tractor Co.

Fuels and Lubricants—F. A. Suess, Continental Oil Co.

Passenger Car—J. H. Booth, Thompson Products, Inc.

Production—N. P. Petersen, Canadian Acme Screw & Gear, Ltd.

Tractor and Farm Machinery—C. T. O'Harrow, Allis-Chalmers Manufacturing Co.

Transportation and Maintenance—O. A. Brouer, Swift & Co.

Truck and Bus—N. R. Brownier, Timken-Detroit Axle Co.

cation, medical services, and a host of other vital matters, Admiral Moreell emphasized.

Robert Cass, assistant to the president of the White Motor Co., was inducted as 1953 SAE president, succeeding Dr. D. P. Barnard of the Standard Oil Co. (Ind.). Other officers elected for the 1953 term are listed elsewhere in this article. New councilors, elected

to serve a two-year term on the SAE Council, are C. A. Chayne, General Motors Corp.; W. S. Cowell, Atlas Asbestos Co., Montreal, Canada; and J. L. S. Snead, Consolidated Freightways, Inc., Portland, Ore.

Again the engineering display with 54 exhibitors drew large crowds throughout the week. Among the newest product developments on display were:

Waukesha Motor Co.—Turbosupercharged 185 hp Diesel engine equipped with Schwitzer-Cummins turbosupercharger.

Auto Specialties Mfg. Co.—Latest design of Ausco Lambert disk brake for passenger cars and trucks.

Sun Electric Co.—Engine power timing light for 6 v, 12 v, and 24 v operation.

Buda Co.—165 hp Diesel engine.

Le Roi Co.—286 hp V-8 truck engine.

Hercules Motors Corp.—Diesel engine equipped with Roosa-Master fuel injection pump.

Titeflex, Inc.—New electrical receptacle.

Koppers Co.—Conformable oil rings.

Monroe Auto Equipment Co.—"Direct Action" hydraulic power steering equipment.

Consolidated Engineering Corp.—Miniature pressure sensing device for measuring hydraulic pressures.

Gemmer Mfg. Co.—Redesigned Hydraguide power steering unit with 30 less parts.

Capacity attendances were recorded at most of the 22 technical sessions that provided approximately 50 papers on a variety of timely engineering subjects. Heralded as the first live television presentation of a technical program at a national engineering convention, the technical session on the new laboratory of The Timken-Detroit Axle Co. featured a combination of slides, movies and a closed-circuit television demonstration of the new dynamometer equipment five miles away from the Rackham Memorial Building where the meeting was held under the chairmanship of Frank

Tests of driving axles never before possible indoors can be performed on this equipment in the Alden Indoor Proving Ground at The Timken - Detroit Axle Company. One output dynamometer is at left, an axle on the test stand at center, the input dynamometer at the right, and electronic control at rear. This equipment was demonstrated by TV at an SAE session, which is described in this article.



W. Kateley, ACF-Brill Motors Co. vice president. The event proved to be a big success with about 1000 engineers in attendance. The laboratory has been named the Alden Indoor Proving Ground in memory of the late Colonel Herbert W. Alden, a founder of the Timken-Detroit company and its former director of engineering until 1950.

L. W. Fisher, Timken-Detroit vice president, first explained how the company tested axles prior to the new laboratory and his talk was then followed by a color-sound film showing the testing of Army vehicles at Camp Bullis, Texas, by the Army Ordnance Dept. Equipment in the Timken-Detroit laboratory (see photo with this article) was described and its operation demonstrated via television by R. W. Roush, Timken-Detroit chief materials engineer, and E. B. Stavelly, Jr., application engineer of General Electric Co., which designed and built the equipment.

L. F. Dumont, research engineer in the petroleum laboratory of E. I. duPont de Nemours & Co., Inc., was presented the SAE Horning Memorial Award in recognition of the excellence of the paper he gave at the 1951 SAE summer meeting on the subject, "Possible

Mechanisms by Which Combustion Chamber Deposits Accumulate and Influence Knock."

Future designs of trucks will provide increased weight on the front wheels and thus assure better load distribution, it was predicted by E. P. Lamb, Chrysler engineer. Power steering will help make possible this improvement.

R. K. Super, of The Timken-Detroit Axle Co., presented the progress report of SAE Brake Subcommittee No. 3, which was devoted to a description of the design features and instrumentation of brake dynamometers, and an outline of the SAE brake dynamometer test code. It was pointed out that the brake dynamometer provides the only logical approach to the selection of a newly-designed braking combination, subject to verification by road testing on the actual vehicle.

Maurice Olley, Chevrolet research engineer, gave a comprehensive paper on European postwar cars and their designs, including also an analysis of the world vehicle market and the volume of cars being exported from the various manufacturing countries. Current designs of European aircooled Diesel engines were re-

The Reciprocating Engine in the Helicopter

By J. J. Shields and J. T. Bowling

Continental Aviation and Engineering Corp.

BECAUSE service experience has shown that the performance of a helicopter engine requires high speed continuous running at or near rated power the Air Force-Navy Specification AN-9502d Engine: Qualification Test for Aircraft Reciprocating has been modified to include a special section covering helicopter en-

gines. The important differences in the 150-hour qualification test between the helicopter engine and the normal fixed wing aircraft engine are shown graphically in Figs. 1 and 2. Fig. 1 shows an index of the power output schedule for both types of engines, and Fig. 2 shows an index of the engine speed. On first glance, these

comparative curves do not emphasize the true significance of these two schedules of operation. The endurance characteristics of an engine may be likened to the endurance properties of the materials used in the components of that engine and thus life expectancy should be plotted on a graph which depicts a narrow band of endurance where the loads are high expanding out to a very broad band as the load or output is reduced. It should be noted that there is double the 110 per cent overspeed running and almost double the normal rated speed running in the helicopter engine test. Taking a piston travel as a parameter of continuous high speed running there is a difference of 17 per cent between the helicopter engine test and that of the fixed wing aircraft engine. On the basis of horsepower hours the helicopter engine is obligated for 20 per cent more than the standard aircraft engine.

The foregoing comparison is on the basis of identical ratings of both engines. The fact that reduction gears are always incorporated in the transmission makes speed less of a factor in limiting the rated power output of a helicopter engine. The limiting tip speed of propellers to some extent controls the acceptable rated speed of a

FIG. 1

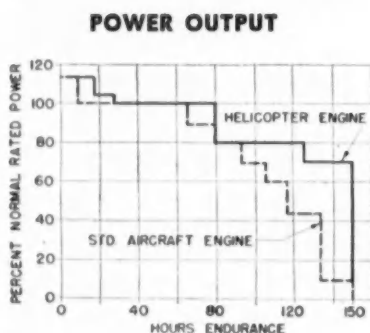
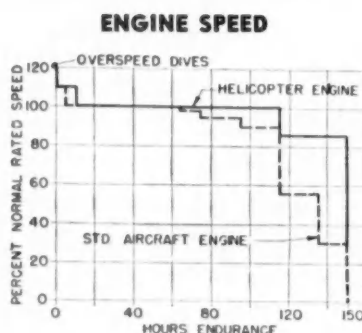


FIG. 2



Comparison of qualification test AN-9502 for standard aircraft engines and helicopter engines.

viewed by Wayne H. Worthington, of the John Deere Waterloo Tractor Works. He found that the specific output and specific fuel consumption of these engines to be comparable with the performance of similar combustion systems in watercooled engines.

Glass fiber reinforced plastics proved a popular topic at the session sponsored by the Body Activity. Samples of built-up, molded, and stamped items now in production were displayed. These ranged from a two-piece outboard motor boat hull to boxes and panels of many shapes and sizes, including the rear door for an ambulance. The parts exhibited were said to be competitive with their metal counterparts.

Speakers declared that though the reinforced plastics industry has largely developed since World War II, it is now sufficiently experienced to build special automobile bodies, truck cabs, and components, in limited production. A fabricator suggested that tooling for a typical sports car body might cost \$100,000. Such tooling in present plants of fabricators employing 100 to 200 people might produce 5000 units per year, at a cost of \$300 to \$350 per unit, according to one speaker. Material supplies, manpower, and plant

capacity were said to be ample to handle such a program immediately.

Design with this new material will require cooperation between the automobile industry and the plastic makers and fabricators, the speakers emphasized. They said that know-how is not widely available, and that new techniques and materials, particularly in the plastic itself, require that the reinforced plastics fabricator employ skilled specialists, such as chemists. The plastics maker and fabricator, as consultants in the design stage, were said to be in the best position to insure a satisfactory limited volume body program for the automobile manufacturer.

Future developments needed before the industry could expect high-volume production were outlined by the speakers. These include a reduction in curing time in the mold from the present seven minutes or more, to about that many seconds. The fiber glass and plastic raw materials would have to be easier to handle by less-skilled labor.

Abstracts of as many of the other outstanding papers as space will permit are presented herewith.

fixed wing aircraft engine. With this not a criterion, there is a tendency to increase the rated output simply

by increasing the rated speed in a helicopter engine. This serves to accentuate the problem.

on the other hand, does not disturb the normal combustion pattern unless the knock becomes excessively severe.

Fig. 1 shows data obtained on a recent model high compression engine in connection with a study of the effect of combustion chamber deposits on detonation and preignition. The combustion chambers of the engine

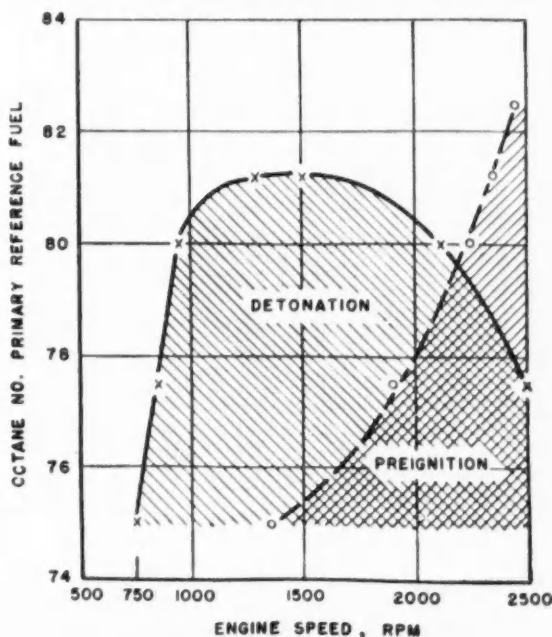
A Method for Identifying Preignition

By R. F. Winch and F. M. Mayes

Sun Oil Co.

THIS method of indicating the occurrence of preignition is based on the fact that the electrical properties of the spark plug gap will vary depending on the time in the cycle at which combustion is initiated and depending on the rate at which the combustion process is completed, i.e., whether or not secondary flame fronts are present. Specifically, changes occur in the conductivity of the gap which are reflected in variations in current flow. These variations in current flow, when observed on an oscilloscope serve as an excellent means of detecting the presence of abnormal combustion. In order to utilize this principle to best advantage, the normal current flow associated with the spark discharge has been supplemented by the use of a constant d-c voltage across the gap. The difference between the current flow pattern produced on the oscilloscope during a preigniting cycle and a normal combustion cycle is sufficiently great that the change from the normal pattern is easily seen. Detonating combustion,

FIG. 1
Octane and preignition requirements of a clean, high compression ratio engine.



were perfectly clean in this instance, and all of the data were obtained under the full throttle, level road, accelerating conditions normally used in octane requirement work. The octane requirement curve was obtained in a conventional manner by observing aurally the appearance and disappearance of knock. At the same time, preignition was observed by means of the method described in this paper. A number of interesting things are apparent from the figure.

First of all, even though the engine was perfectly clean, there was considerable preignition present. This preignition would have been even worse with commercial-type fuels which are lower in their resistance to preignition than are the primary reference fuels. Thus, the well laid plans of this particular engine builder for control of combustion and such related functions as rate of pressure rise were well confiscated by preignition.

The figure also illustrates the fact

that preignition can occur without producing audible knock. Following across the 78 octane line, as an example, it is seen that knock appears at about 850 rpm. Going on up through the acceleration, knock continues without the presence of preignition up to 2000 rpm when the engine begins to preignite. Both preignition and knock continue up to about 2450 where the knock dies out. The preignition, however, continues and actually becomes more and more severe as the speed is increased.

The chart also serves to illustrate the difficulty of trying to study the phenomena of knock and preignition simultaneously without proper instrumentation for differentiating between the two. At octane levels above 81.5, for example, no knock can be found, although preignition is apparently going to be present at speeds above 2500 rpm, more or less independent of fuel octane quality.

that the torque multiplication obtained in the free power turbine with decreased speed is substantially greater than that obtained with the piston engine. With the mechanically connected turbine, the torque decreases with decreasing engine speed. Further, in Fig. 1, it is seen that the shaft power characteristic with the engine speed is much flatter over a range of engine speeds than either the piston engine or the mechanically connected turbine. A constant power characteristic, such as this, allows a greater range of operating speeds without loss of power, and therefore, greatly simplifies the control system requirements.

Fig. 2 shows the variation of engine power, torque, and specific fuel consumption with power turbine speed. It is seen that the engine minimum specific fuel consumption occurs at full power and full speed. This is very desirable for a helicopter application, especially if the craft is required to hover for extended periods of time. For cruise conditions (approximately 65 per cent full power), the specific fuel consumption increases approximately 10 per cent over the full power value at sea level. However, this increased part load specific fuel consumption is partially reduced when the engine is operating at altitude.

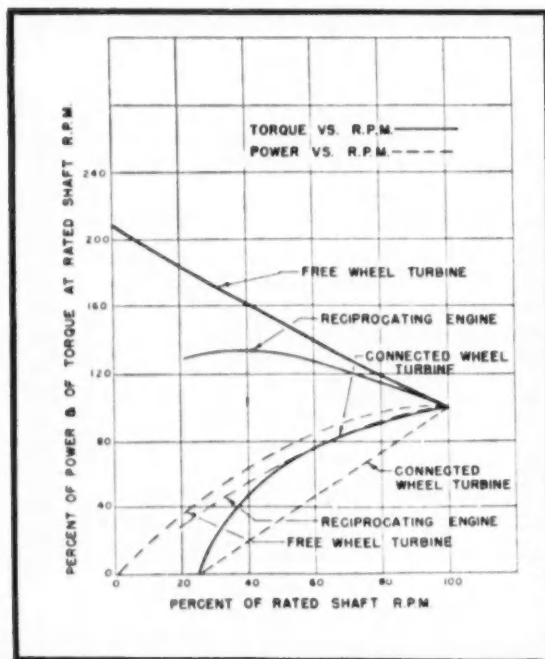
Design Considerations for Helicopter Gas Turbine Powerplant

By J. L. Keetting and Leon R. Wesika
Solar Aircraft Co.

THE mechanically free power turbine configuration offers, performance-wise, very definite advantages over the piston engine and the me-

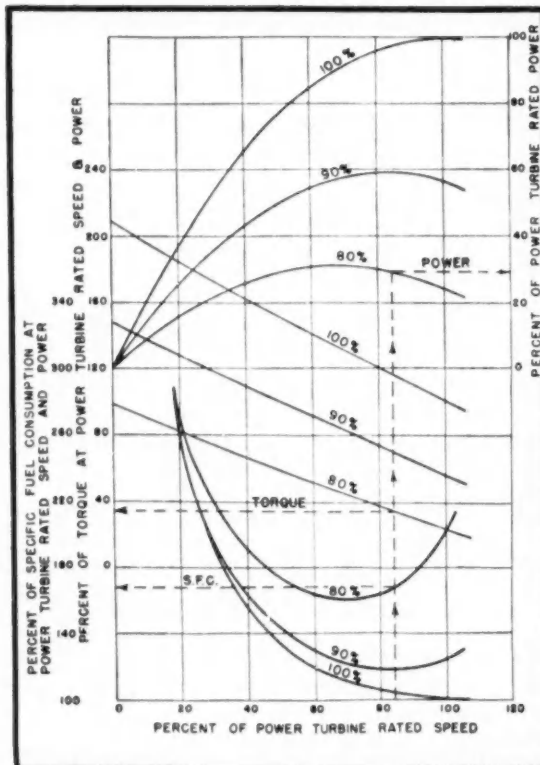
chanically connected gas turbine engine. Referring to Fig. 1, it is seen

FIG. 1



Comparison curves.

FIG. 2



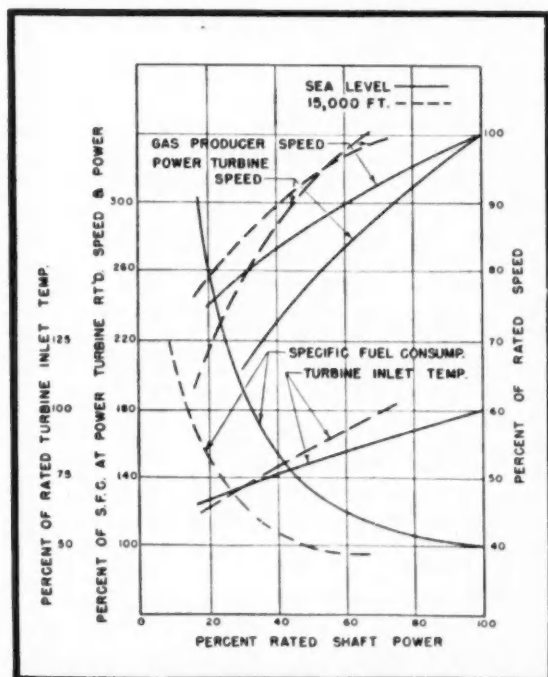
Effect of power turbine speed on engine performance.

Referring to Fig. 3, below, note that the specific fuel consumption decreases slightly with increase in altitude. This holds true for moderate altitudes where viscosity effects on the engine component efficiencies are negligible. Fig. 3 also shows the variations of turbine inlet temperature, power turbine speed, and gas producer speed with shaft power at sea level and at 15,000 feet.

The helicopter requires full take-off power for hovering. Since hovering is such an important feature of the helicopter and it is a continuous operation, it seems logical that the powerplant be rated at a maximum continuous turbine inlet temperature instead of at a maximum allowable short temperature. This rating would have greater significance for the helicopter application than a short time take-off rating which was created for an entirely different type of aircraft.

Based on a maximum continuous take-off power rating, the ordinary open cycle, mechanically free power turbine will deliver between 80 per cent and 85 per cent of its 59F standard day power on a 100F hot day. In reality, the gas turbine powerplant is penalized accordingly and the hot day rating becomes a significant datum.

Helicopters at the present time and in the immediate future probably will not operate over 15,000 feet altitude; therefore, problems with high altitude combustion and ignition are absent from this type of powerplant.



Gas turbine performance standard altitude conditions.

BUICK WEIGHT COMPARISON

	Series 70		Difference
	1952	1953	
Cylinder block and crankcase	248.67	176.52	-72.15
Cylinder head	93.34	105.99	+12.65
Flywheel housing	20.40	1.03	-19.37
Crankshaft	114.21	55.91	-58.30
Crankshaft balancer	13.68	0.00	-13.68
Flywheel	12.05	9.44	- 2.61
Connecting rods, pistons and rings	30.74	28.59	- 2.15
Oil pan	13.60	9.36	- 4.24
Oil pump and drive	5.82	5.15	- 0.67
Oil distribution system	0.12	0.13	+ 0.01
Oil filler	0.26	0.50	+ 0.24
Oil gage rod	0.11	0.12	+ 0.01
Oil Filter	5.09	5.20	+ 0.11
Engine ventilating system	3.13	1.75	- 1.38
Engine front covers	6.89	12.02	+ 5.13
Fan and drive	4.67	9.52	+ 4.85
Water pump and drive	13.26	7.66	- 5.60
Thermostat and engine cooling parts	4.15	6.16	+ 2.01
Intake and exhaust manifolds and heat controls	46.40	50.61	+ 4.21
Carburetor	9.81	10.43	+ 0.62
Air cleaner and silencer	9.89	13.11	+ 3.22
Fuel and vacuum pump	5.94	5.88	- 0.06
Power plant mountings	4.65	4.55	- 0.10
Camshaft and drive, valve springs and lifters	48.54	31.47	-17.07
Valve rocker arms, shafts and covers	16.95	13.75	- 3.20
Generator	24.85	22.24	- 2.61
Starting motor and control	25.83	23.92	- 1.91
Distributor	6.13	6.43	+ 0.30
Spark plugs, ignition coil and wires	4.93	6.49	+ 1.56
Total Engine Dry	794.11	623.93	-170.18

New Buick V-8 Engine

By V. E. Matthews and J. D. Turley

Buick Motor Div., General Motors

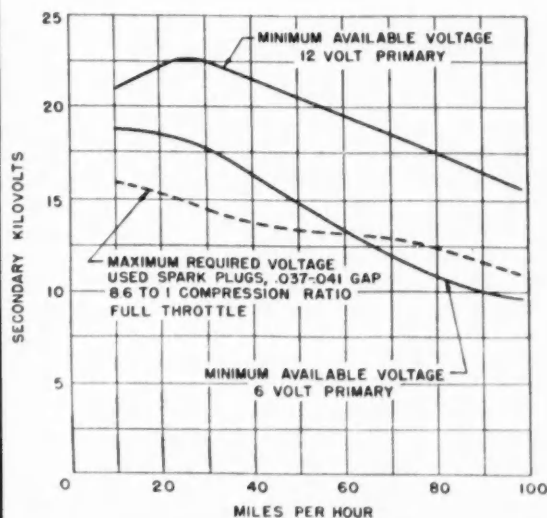
THE greatest weight saving in the new Buick engine was obtained by

adopting the inherently lighter 90 deg V-8 principle. Every design detail was investigated for possible further weight reduction. Many of the old rule of thumb drafting room design standards were found to result in oversized and overweight parts. The reduction in size of lightly loaded flanges and bolt bosses, for example, provided worthwhile savings when applied to the entire engine.

(Turn to page 78, please)

FIG. 3

FIG. 1



Secondary voltage comparison with full electrical load.

JOB EVALUATION

in Automobile and Parts *Plants*

By Elizabeth Lanham, Ph.D.

Assistant Professor of Management
College of Business Administration
The University of Texas

Survey of 135 Companies

A recent survey of job evaluation programs in 26 automobile and 109 automotive parts manufacturing companies located throughout the United States reveals not only the extent of utilization of this management technique in these fields but also the procedures and practices followed by such organizations in installing and maintaining their programs.

Among the 26 automobile manufacturing companies answering our questionnaire, 10 had job evaluation installations, while 54 installations were found among the 109 automotive parts manufacturing concerns. Greater utilization of job evaluation is planned in the future in both fields since a number of companies are currently installing programs or are planning to install them. However, 13 of the 26 automobile manufacturing and 31 of the 109 automotive parts organizations stated that they had no job evaluation programs in effect nor any plans to install them. None of the automobile manufacturing companies reported that plans had been adopted and discontinued. One automotive parts firm stated that a job evaluation plan was set up but that it had never been put into effect because of union opposition. All of the automobile companies reported that their programs have been installed within the last decade. Six of the plans were completed during the war years, and the remaining four immediately following the war. Fifty-one of the 54 automotive parts firms also completed their plans within the last decade with the greatest number completed during the war years or immediately following. Three plans in this field date back to the 1930's.

The reasons which were given for installing the job evaluation program by the companies in both industries vary; however, those reported with the greatest frequency in the automobile manufacturing field were: to create equity in salary and wage administration; to provide definite, systematic, and factual data for deter-

mining the relative worth of jobs; to improve salary and wage administration; to standardize salary and wage costs; and to increase employee morale.

The automotive parts manufacturing industry reported basically the same reasons for installation as cited above. However, the order of emphasis varied slightly. For example, to create equity in salary and wage administration was second in this field and first in the automobile manufacturing. In addition to the change in order of popularity, the automotive parts industry reported that one of its most popular reasons for installation was to establish a basis for placement and promotion. Although this was a popular reason in automobile manufacturing, it was not among the top rank of reasons.

Securing Cooperation

The original idea of investigating the advantages of a job evaluation program came more frequently from the personnel director than from any other individual in either field. The president of certain companies as well as a wage and salary committee were credited with the idea in a number of firms. Two automobile manufacturing companies reported that the union first made the suggestion, while two automotive parts companies said that the company and union bargaining unit first suggested job evaluation. The predominant trend in both fields has been for the idea to come from representatives of management rather than from rank-and-file workers. Top management authorized the job evaluation study in practically every company represented in this survey. The president of the company or the executive committee was primarily responsible for authorization in the automobile manufacturing field. In addition to the two above, the board of directors gave authorization in a number of the automotive parts companies.

All of the companies in both fields recognized, in the initial stages of inaugurating their programs, the

TABLE I
AUTOMOBILE MANUFACTURING

Factors Used	Frequency of Use		
	Hourly	Salary	Same for Both
Responsibility for .....	..	..	2
Equipment or Process	2	1	1
Materials or products	2	..	1
Factors Used			
Safety	2	..	3
Planning and Scheduling .....	..	1	..
Work of Others	2	1	1
Errors .....	..	2	1
Investigations and fact finding .....	..	1	..
Confidential Data .....	..	2	3
Loss .....	..	..	1
Standards .....	..	1	..
Functional Control .....	..	1	1
Responsibility without supervision .....	..	..	1
Company assets .....	..	1	2
	8	11	17*
Knowledge .....	..	..	2
Education	2	2	3
Experience	2	2	4
Training .....	..	..	2
	4	4	11*
Effort and Skill .....	..	..	2
Physical application	2	..	4
Mental application	2	2	2
Initiative and ingenuity	2	..	..
Complexity .....	..	2	3
Accuracy .....	..	..	1
	6	4	12*
Physical:			
Working conditions	2	2	4
Hazards	1	..	2
	3	2	6
Personal and Social:			
Contacts with others .....	..	3	4
Personal characteristics .....	..	..	1
	..	3	5
Supervision .....	..	..	1
Supervision given .....	..	1	2
Supervision received .....	..	2	1
Character of supervision .....	..	1	..
Scope of supervision .....	..	1	..
Supervision required .....	..	..	1
	..	5	5

* Some companies indicated the use of more than one factor in the group.

necessity of informing supervisors of the objectives sought and techniques of administration. The four methods used in the automobile manufacturing companies to inform supervisors were staff meetings, conferences with individual staff members, departmental group meetings, and letter or memorandum from the president or management. The four most popular methods utilized in the automotive parts companies were staff meetings, departmental group meetings, conferences with individual staff members, and letter or memorandum from the president or the executive committee. All but two of the automobile manufacturing concerns made a definite effort to inform nonsupervisory workers about the proposed job study, while all of the automotive parts companies made this attempt. The three most popular methods for the former were: union representatives told employees about the proposed plan; supervisors informed employees; and special bulletins were issued to employees. The automotive parts firms reported the following three as being the most popular methods: supervisors informed workers; union representatives informed workers; and group meetings were held with workers. General procedures to be followed in installing the program, the scope of the program, and advantages both to management and the workers were emphasized in trying to give each group information regarding the plan. The why as well as the how was given.

Types of Rating Plans

There are four generally accepted methods of evaluating the relative worth of jobs. These are the ranking method, the job classification or grading method, the factor-comparison method, and the point method.

Over twice as many automobile manufacturing companies have used the point method for evaluating their jobs as have used any other plan of rating. The point plan led in the automotive parts industry also, since 55.8 per cent of the companies reported rating their jobs by this method. (One

TABLE 2
AUTOMOTIVE PARTS MANUFACTURING

Factors Used	Frequency of Use		
	Hourly	Salary	Same for Both
Responsibility for	1	1	4
Personnel			1
Company assets		1	6
Methods			1
Confidential data			7
Material and equipment	2		13
Public relations			1
Safety			8
Errors		1	6
Decisions			3
Production			5
Work of others	1		2
Costs		1	4
Company policy			1
Customers and markets			1
Labor delay	1		
	5	4	63
Knowledge			6
Education	1	2	21
Training and experience		1	5
Mentality			5
Analytical ability		1	7
Experience	1	1	15
Learning time			7
Job knowledge	1		8
Job essentiality	1		
	4	5	74*
Effort and Skill	1		2
Skill			8
Initiative and ingenuity	1	1	10
Mental application	2	1	23
Physical application	2		23
Dexterity			2
Versatility		1	5
Judgment		1	5
Alertness			1
Adaptability			1
Complexity		2	8
Creative ability			3
Accuracy			6
Dependability		1	1
	6	7	98*
Physical:			
Working conditions	3	1	25
Hazards	2		12
Surroundings			6
	5	1	43
Personal and Social:			
Personal requirements		1	2
Skill in dealing with people			2
Contacts with others		1	12
		2	16
Supervision			4
Supervision received		1	8
Supervision given	1	1	7
Character of supervision given		1	5
Scope of supervision given		2	5
Supervision required			1
	1	5	30

* Some companies indicated the use of more than one factor in the group.

of the factors influencing the wide choice of the point plan was the work of the N.E.M.A. and the N.M.T.A. in the area of the point-rating method for factory positions.) The factor-comparison and the grade or classification methods tied for second place in popularity in the automobile industry while the factor-comparison method was second in popularity in the automotive parts field, and the grade or classification method was used by only one firm. None of the automobile firms used the rank method while only one of the automotive parts companies reported its use. A number of automotive parts companies combined certain techniques from one or more of the rating plans and thus had a hybrid type plan. Only one automobile company followed this practice.

A wide variation in the assignment of responsibility for selecting the particular rating plan to use existed in both the automobile and automotive parts manufacturing industries. A management consultant was relatively active in the former field while a representative of the personnel department, either serving alone or with another individual or group, has selected the rating plan in more instances than any other person in the automotive parts industry. A representative of the industrial engineering department as well as a management consultant also have served in the latter field. The committee plan was less popular in selecting the rating method in both fields than was the assignment of this responsibility to one person. The automobile companies chose their particular rating plan primarily because it better suited company needs, was recommended by a management consultant, or it had been successfully used by other companies in the field. The automotive parts firms gave four basic reasons for their choice, namely, better suited company needs, was recommended by a management consultant, could be more easily understood by employees, and had been used successfully by other companies in the field. The prevailing practice in the automobile manufacturing industry was to have one individual design the rating plan to be used; the consultant was responsible for this function in the majority of firms. A wide variety of practice existed in the automotive parts manufacturing field. The head of industrial engineering, the man-

agement consultant, and the personnel director were relatively active where organizations assigned the primary responsibility for designing the rating scale to one person. The automotive parts companies were about equally divided between the practice of having a committee design the plan and the practice of having one individual design it. Membership on the committee varied, but personnel director and management consultant were active.

Job Evaluation Installations

In installing a program of job evaluation, by the very nature of the work itself, the procedure to follow, or the sequence of steps, does not lend itself to much variation. The proposed program must be introduced to the company, the rating plan selected, job facts secured, job descriptions written, jobs rated and classified, pay rates determined, and administrative policies established. An analysis of the steps reported by the companies reveals that in all cases the typical sequence of steps was followed. This situation is undoubtedly explained by the fact that one step must be carried out before the succeeding step can be taken. For example, before jobs can be rated, a rating plan must be developed and job facts gathered. Before jobs can be grouped into classes, they must be rated. Thus it is with all major phases in the development of a program of job evaluation. Certain major phases of the respondent's programs, however, will be elaborated upon in order to show the specific procedures used in this field.

Company employees played the dominant role in the installation of job evaluation in the automobile manufacturing field. Either they were charged with the entire responsibility, were assisted by management consulting firms, or they assisted management consulting firms. The last plan was the most popular since 50 per cent of the companies followed this procedure. Company employees alone installed the plan for one company; none of the concerns had a management consultant assume the entire responsibility for the installation. The most popular practice in the automobile

(Turn to page 104, please)

TABLE 3

AUTOMOBILE INDUSTRY

Advantages Secured from the Installation of Job Evaluation Programs	
Advantages	Number of Companies
Salary equity	10
Better morale	7
Better promotion, transfer, and placement policies	9
Consistency, uniformity	10
Factual basis for determining the worth of jobs	8
Better control over salary costs	7
Standardization of salaries	9
Reduced employee turnover	3
Improved organization	6
Standardized wage payment policies	1
Curtailed employee grievances	1
Elimination of additional employee union organization	1
	72*

* Some companies gave more than one advantage received from the plan.

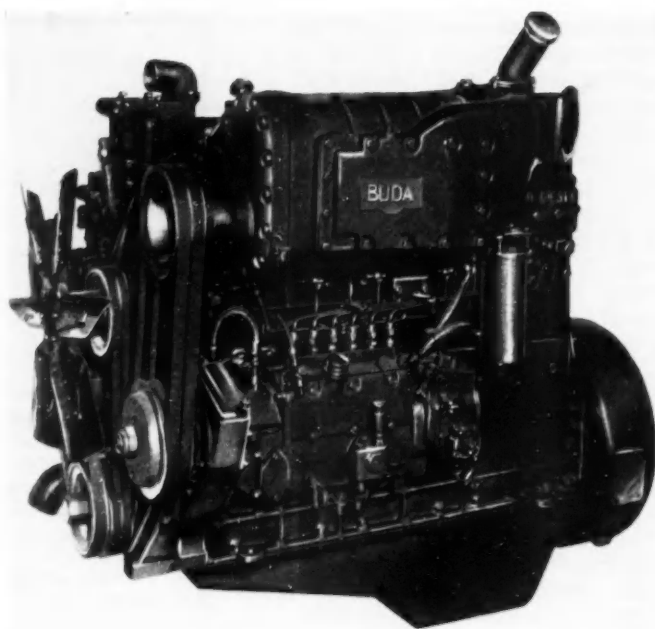
TABLE 4

AUTOMOTIVE PARTS INDUSTRY

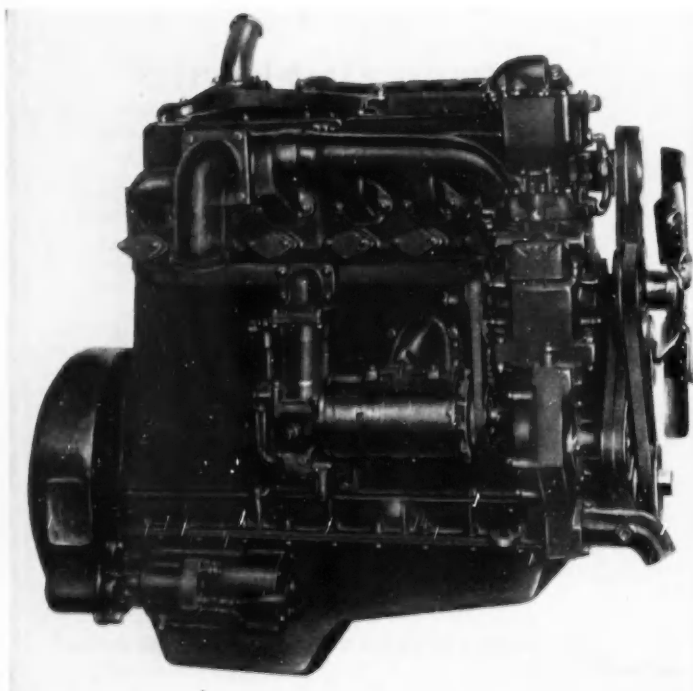
Advantages Secured from the Installation of Job Evaluation Programs	
Advantages	Number of Companies
Factual basis for determining the worth of jobs	48
Salary equity	46
Consistency, uniformity	46
Better promotion, transfer, and placement policies	42
Standardization of salaries	35
Better morale	33
Improved organization	28
Better control over salary costs	25
Reduced employee turnover	14
Governmental agency acceptance of salary administration policies	1
Control of labor costs	1
Greater union cooperation	1
A more comprehensive basis for bargaining discussions on job classifications and pay rates	1
	321*

* Some companies gave more than one advantage received from the plan.

Left quarter view of the new engine showing positive displacement type supercharger, fuel injection pump, etc.



Buda's Compact 165-Hp Diesel



Right side view of the Buda Model 6-DAS-516 supercharged Diesel engine.

A COMPLETELY new supercharged Diesel, designed especially for use in heavy duty trucks of the 60,000 lb GVW class, has been announced by the Buda Co. Known as the 6-DAS-516, it is a four-stroke, six cylinder heavy duty, high speed engine that develops 165 hp at 2400 rpm, and has a maximum torque of 402 lb ft at 1600 rpm. Bore is 4 7/16 in., stroke 5 9/16 in., and piston displacement 516 cu in.

Overall width is 32 11/16 in. and length is 47 1/2 in. This short length simplifies the truck designer's problem in that no completely new front-end design is required to accommodate the new Diesel in place of a gasoline engine. The engine will mount in a 28-in. wide truck frame. Overall weight of the engine, including 12 volt electrical equipment and a 7 1/4 cu-ft air compressor, is 1825 lb. Fan to flywheel weight of the engine, less electrical equipment and compressor, is 1625 lb.

The belt-driven supercharger is of the positive displacement type, and operates at relatively low speed.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Clearing Shows New Presses

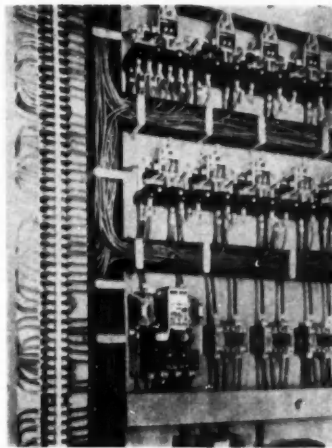
An actual performance demonstration was given recently by Clearing Machine Corp., Chicago, Ill., of a new press that utilizes the Guerin principle, or rubber pad method, for forming. The idea of the demonstration was to give the Kawneer Co., Niles, Mich., purchasers of the press, a preview of its press in action and to witness Clearing construction methods.

Clearing also unveiled another new type press recently for the cupping and drawing operations in the manufacture of cartridge cases. Of the double end horizontal hydraulic type, the press was designed for the Rheem Mfg. Co. A battery of these presses have been installed, along with conventional Clearing presses in the Rheem plant in New Orleans, La. For further information concerning the double end type press see the New Plant and Production Equipment Section of this issue, page 60.

Snyder Develops Wiring Method

After two years experimentation, the Snyder Tool & Engineering Co., Detroit, Mich., has adopted as standard a new channel method of electrical panel wiring. The system employs specially made, U-shaped fiber channel as main arteries for the wiring. This channel is fastened to the panel board above a row of electrical devices with its open face outward, see illustration. Wires are laid in the channel and the ends are pulled through convenient holes to connect to the various electrical units. When the wiring is complete, covers are fastened over the open face of the channel by means of wing nuts on studs.

According to Leo P. Gajda, chief engineer of Snyder, wiring by this method eliminates the need for detailed planning, since with the electrical devices in position, connections may be read directly from the schematic drawing, the wire is prepared



Snyder channel method of electrical panel wiring has been adopted as standard after two years of experimentation in the plant and in the field.

in exact length, placed in the channel, connected, and checked off the drawing.

Diamond Wheels

In a report on diamond wheels, we find that a brushing method has been developed which is said to increase the cutting action of used wheels by 80 per cent. Currently the method is being utilized by S. K. Wellman Co., Cleveland, Ohio, and it was worked out in collaboration with the Osborn Mfg. Co., Cleveland, Ohio. The procedure is to use a wire brush to remove some of the brass matrix, leaving the industrial diamonds sticking up for better cutting action.

Diamond wheels are used by Wellman to cut grooves in silicon alloy material which is used for clutch plates. Various wheel sizes are utilized: three in. diam, $\frac{1}{8}$ and $\frac{1}{4}$ in. thick; and eight in. diam, $\frac{1}{8}$ and $\frac{1}{4}$ in. thick. The outer rim of the wheel is bonded $\frac{1}{8}$ or $\frac{1}{4}$ in. thickness of industrial diamonds in the brass matrix.

In truing up the diamond wheels, Wellman brings into play a brake con-

**Machinery Builders
Disclose New Developments,
Non-Circular Gear Business
Started, and Another
Way to Save Diamond Wheels.**

trolled truing device. Two wheels are squared up at one time by pancaking them together in a Delta Toolmaker held on a magnetic chuck. While the diamond wheels rotate, the rotating grinding wheel is passed back and forth across their face. Approximately $\frac{1}{32}$ of the diamond wheel is taken off, of course depending on the amount of truing necessary, and it takes roughly 30 min for the operation.

When the surface of both diamond wheels is uniform and there is no visible parting line between the wheels, they are dressed with an eight in. Osborn wire brush. Both the brush and the diamond wheels are turned up to 3600 rpm.

Gear Index

Using the 1947-49 base, the American Gear Manufacturers Association index of gearing volume for December, 1952, is computed to be 140.9. This is 6.5 per cent under the previous month.

Marform

One of the interesting features concerning a 6500 ton Marform press ordered by the Glenn L. Martin Co., Baltimore, Md., from Hydropress, Inc., New York, N. Y., is that the simplified tooling arrangement of the press also permits the use of the unit for Guerin and other deep drawing processes. According to the maker the press is largest of its type currently on order.

Non-Circular Gears

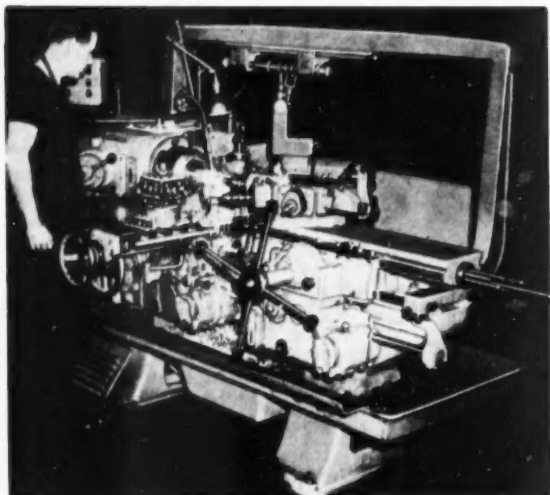
What is claimed to be the world's first private business devoted wholly to the design and manufacture of non-circular gears, was announced recently by Dr. Fred W. Cunningham, resident consultant to Arma Corp., Brooklyn, N. Y. Base of the business, to operate under the Cunningham name, is the automation of a standard gear shaper which operates by a motion picture film. Purpose of the business is to provide engineering and manufacturing help to any who need such services in connection with non-circular gears.

NEW**EQUIPMENT****PLANT • PRODUCTION**

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

Hydraulic Tracing Attachment for Lathes

A recently disclosed turret lathe hydraulic tracing attachment has been designed for exclusive use on any J&L ram or 7A saddle universal



J & L hydraulic tracing attachment.

bar or chucking machine for general tracing, multi-step shaft, and contour work. This attachment is powered by a differential type cylinder. The tool-carrying stylus, and cutting tool are mounted on the back of the cross slide on a bridge type carriage, thus freeing the square turret for other operations on the same piece.

This tracing attachment can also be utilized for turning tapers. A hardened straight edge, set at the desired angle, serves as a template or former.

In addition to the actual tracing and taper-turning functions, this attachment makes available all of the known facilities of a turret lathe, in effect, on a profiling lathe. Thus, fast "hogging" of stock, threading, or any other turret lathe operation can be accomplished without removing the piece. *Jones & Lamson Machine Co.*

Circle E-1 on page 65 for more data

Engine Camshaft Comparator Redesigned

Engine camshafts are checked against a master cam to determine the variances in the cam contour of the part on a recently designed camshaft comparator. The master cam

is ground and lapped to an accuracy of 0.0001 in. Cam contour variances are shown on a 0.0001 in. dial indicator and simultaneously recorded on a linear chart. The dial indicator

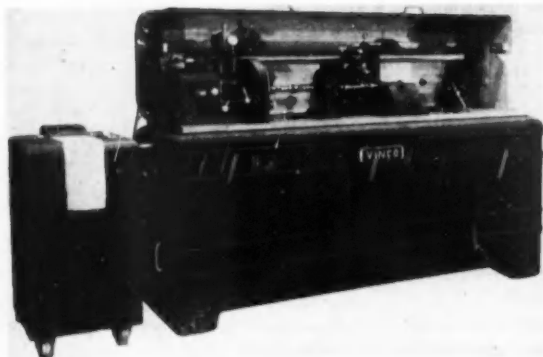
readings and chart recordings are identical and will repeat within 0.0001 in. Cam lobe and keyway timing errors are shown on an inbuilt, Vernier equipped, graduated plate and the timing check is accurate to within one min of arc. Although the instrument is tooled for an individual camshaft, a wide range of sizes can be accommodated.

Work Capacity

Between centers, up to 44 in.
Journal diameters, up to 2 1/2 in.
Cam base circles, up to 1 1/2 in.
Cam rise, 0 in. to 3/8 in.

Full inspection of a camshaft (cam contours, cam relationship, and timing) requires approximately 30 min. *Vinco Corp.*

Circle E-2 on page 65 for more data



Vinco camshaft comparator.

300-Amp A-C Welder Features Stepless Current Selection

A redesigned 300-amp a-c welding transformer, featuring stepless current selection from 40 to 375 amp, has been announced.

The welder, for practically all applications from light-duty, low-current sheet metal work to heavier-duty, high-current industrial jobs, incorporates an enlarged scale and finely threaded screw adjustment to facilitate easy current selections. It accommodates electrodes from 3/32 to 1/4 in. diam, and has a handy range switch which enables the operator to change quickly from high to low or low to high range.

Arc-stabilizing capacitors in the redesigned equipment are said to contribute toward increased production by enabling the operator to strike and maintain an arc without popouts.

Extra protection against high temperature coil failure is provided by silicone insulation. To further protect the coils from hotspots, they are ventilated by a forced-draft fan rated

GE 300-amp a-c welder.

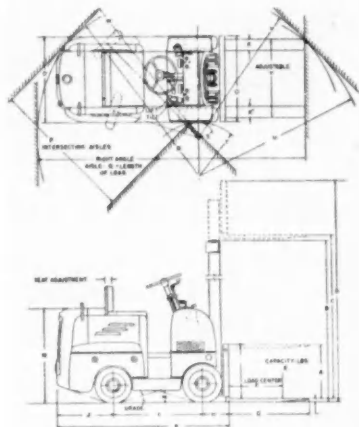


for continuous duty in this welder.

The welder is built with studs at the base to simplify connecting electrode and work cables. The welder

is 36 in. high, 21 in. in diam, and weighs approximately 328 lb. *General Electric Co.*

Circle E-3 on page 65 for more data



Completely Redesigned Fork Lift Trucks

The FT Series gasoline or Diesel engine powered fork lift trucks have been placed on the market. This series is available with either a conventional or torque converter type transmission. Capacities of the vehicles range from 3000 to 7500 lb.

This latest series of fork lift trucks features a positive hydraulic system for lifting and tilting, an all roller

rolled steel mast, two independent roller type lift chains, and a self aligning lift cylinder. The front wheel drive axle is a full floating, double reduction type and equipped with anti-friction roller bearings. Center point automotive type steering is utilized.

The Buda Co.

Circle E-4 on page 65 for more data
(Turn to page 58, please)

Explanation of the letters in the line drawing at the left is contained in the chart below.

MODEL	A Free Lift	B Height Mast Lwd	C* Height Lift	D Height Mast Ext'd	E Ca- pacity lbs.	F Load Center inches	Weight lbs.	Tilt Degrees		DIMENSIONS IN INCHES																		
								For- ward	Back- ward	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
FT30-15 FTD30-15 (Diesel)	24	71	96	110	3000	15	4950 5040	5	10	30	12	40	22	74	28 1/4	5 1/4	42 1/2	38	60 1/2	81	77 1/2	7	19 1/2	69 1/2	60	60	4	16-35
FT30-24 FTD30-24 (Diesel)	24	83	108	134	3000	24	5838 5928	5	10	36	12	40	24 1/4	75 1/4	28 1/2	5 1/4	42 1/2	38	63 1/2	84	83	7	23 1/4	76 1/2	65	72	5	18-38
FT40-18 FTD40-18 (Diesel)	24	83	108	134	4000	18	6008 6098	5	10	36	12	40	24 1/4	76 1/4	28 1/2	5 1/4	42 1/2	38	63 1/2	84	83	7	23 1/4	76 1/2	65	72	5	18-35
FT40-24 FTD40-24 (Diesel)	24	83	108	134	4000	24	6348 6438	5	10	36	12	45	24 1/4	81 1/4	24 1/2	5 1/4	42 1/2	38	65 1/2	89 1/2	89 1/4	8 1/2	27 1/2	79 1/4	65 1/2	77 1/2	5	18-35
FT50-24 FTD50-24 (Diesel)	18	83	108	140 1/2	5000	24	7959 8069	5	10	36	14 1/2	50	24	88	29 1/2	6 1/4	46	42	71	96 1/2	94 1/2	7 1/2	28	84	68 1/2	82 1/2	6	20-39
FT60-24 FTD60-24 (Diesel)	18	83	108	140 1/2	6000	24	8984 9094	5	10	42	14 1/2	55	24	93	24 1/2	6 1/4	46	42	74 1/2	102 1/2	103	9 1/2	33	91 1/2	74 1/2	88	6	20-39
FT75-24 FTD75-24 (Diesel)	18	83	108	140 1/2	7500	24	9545 9635	5	10	42	14 1/2	62	24	100	22 1/2	6 1/4	46	42	77 1/2	110 1/2	112 1/2	13 1/2	39 1/2	97 1/2	77 1/2	96	6	20-39

NEW**EQUIPMENT****PLANT • PRODUCTION**

For additional information, please use postage-free reply card on page 65

(Continued from page 57)

Vertical Chucking Grinding Machines

Now available is a vertical chucking grinding machine, in six sizes—30 in., 36 in., 42 in., 54 in., 64 in. and 74 in.—for grinding larger sizes of work.

A variable speed drive provides infinitely variable table speeds, from creeping to top speed, as specified, and reversing controls are provided. Grinding spindle speeds can be furnished to meet customer's requirements, with maximum motor horsepower rating for the main head grinding spindles of 10 hp and for side head grinding spindles, five hp. The grinding heads are equipped with a hydraulic drive for smooth reciprocating action. The rate of reciprocation is controlled by a selector dial having 12, set orifice type valves for metering the flow of oil.

A fine feed and an adjustable dwell are provided for grinding up to shoulders in combination with any of the 12 available reciprocating speeds.



Bullard vertical chucking grinding machine.

This fine feed and dwell can be used together or independently and can be set for the bottom, top or both ends of the stroke. Adjustable cams control the length of stroke and positive stops assure accuracy. The main head can be swiveled 30 deg to the right or left of center and the side head swivels 20 deg above or below the horizontal position.

Dual control desks with push button controls are provided. Desks are interlocked so that only one is oper-

able at any time. Wheel dressers, hydraulically operated, with adjustable reciprocating speeds are mounted on each head.

Grinding wheels are mounted on the motor armature shaft, and the grinding spindle housing incorporates the motor field. Hardened and ground square lock ways for both heads are concealed and protected within the head housing.

Non-metallic surfaces bear against the hardened way and adjustable taper gibs are provided. Grinding slides within the heads are always in full bearing. Overhand is constant for all grinding strokes. All exposed bearings are protected by scrapers and grit shields. The neoprene guard for the cross rail bearings is ribbed with steel stays. Infinitely variable reciprocating speed, hydraulically operated, wheel dressers are built into each head. The construction is such that the wheels can be properly dressed to specific requirements without upsetting the grinding cycle. Wheel dressers are equipped with their own independent reciprocating ways.—The Bullard Co.

Circle E-5 on page 65 for more data



Industrial Freezers

Low temperature testing is reported to be practical for any size laboratory or test department with the XV-70 Series industrial chilling machines just announced. The unit holds any temperature from -10 to -70 F and has a thermal capacity of 500 Btu per hr.

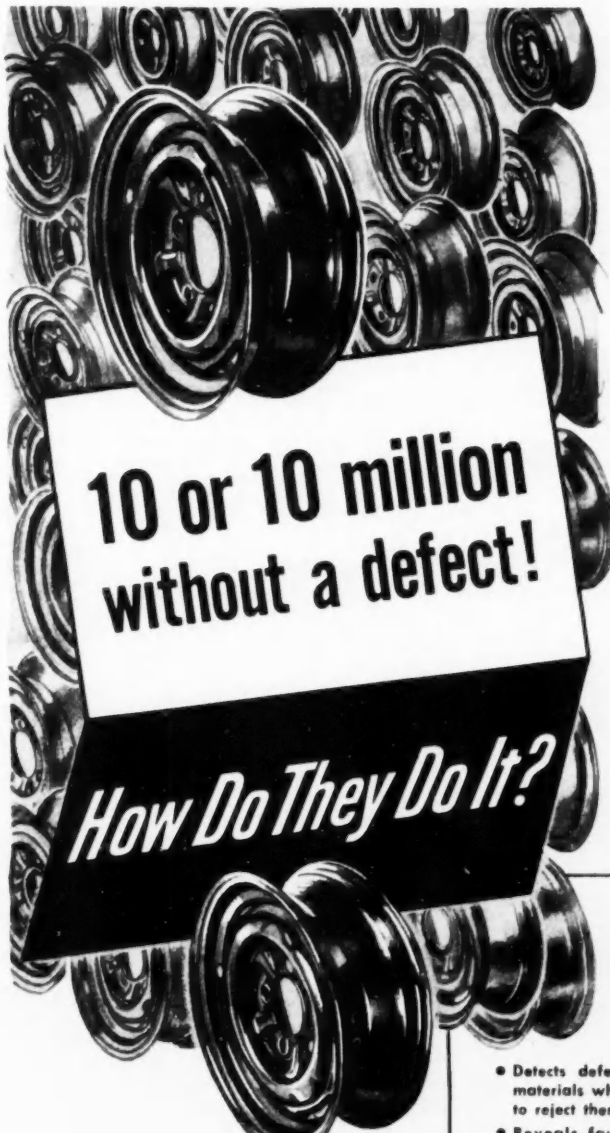
For flexibility in application, the

XV-70 is available in chilling chamber sizes ranging from five down to 1.5 cu ft. Since the unit is designed primarily for testing, the largest chilling chamber dimensions will be 30 in. by 18 in. by 16 in. deep.

In view of the chilling chamber capacities, the XV-70 Series is unusually compact in overall size, the manufacturer reports.

XV-70 has a chilling chamber wall of 3/16 in. steel to facilitate the handling of heavy or sharp-edged metal parts. The lid is counterbalanced. Special design is claimed to eliminate moisture condensation on the outside of the lid and cabinet. Sub-Zero Products Co.

Circle E-6 on page 65 for more data
(Turn to page 60, please)



**10 or 10 million
without a defect!**

How Do They Do It?

It's like the magician's trick—even when you know how it's done, it's still amazing.

Such industrial "magic," for example, as producing 10 or 10,000,000 identical objects—from automobile wheels to rifle barrels—without a defect in the lot!

Some manufacturers do it by *final* inspection only, and reject all pieces not up to standard. This does the job, *but* is needlessly costly!

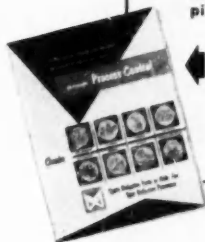
The *economical* answer is process control. Usually it includes inspection by Magnaflux' Methods. We think of it as "correctioneering"—the detection of invisible cracks and defects in any type of material at the earliest possible stages of production. Thus, the cause can be corrected, quality assured, and cost reduced, by preventing waste of labor and machine time on defective parts or materials.

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- Insures consistently acceptable quality at lowest cost per piece.

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(Continued from page 58)

Double End Horizontal Hydraulic Press

A different type of hydraulic press, of double end, horizontal construction, for the cupping and drawing operations in cartridge case manufacture has been developed. Both ends of the press are utilized for productive work.

Some of the features according to the maker are lower first cost, conveyorized material handling systems more readily adapted, reduced power

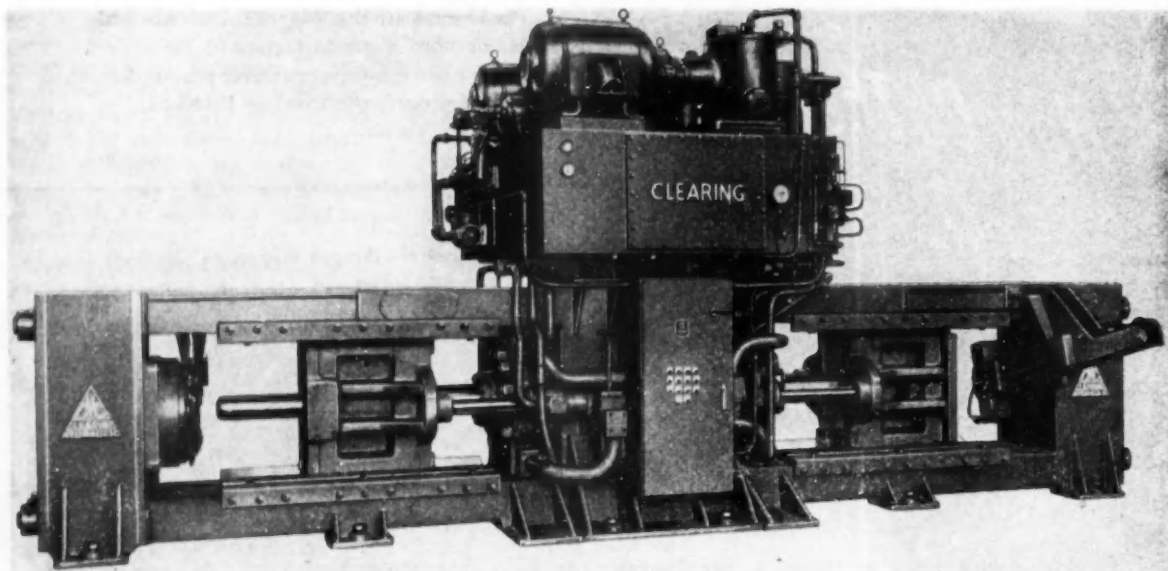
consumption, and the fact that foundation pits are not required. Capacity of the press is variable from zero to 330 tons on each side. Dimensions of the slides and beds are 30 in. by 30 in. in both cases.

The presses have a closing speed of 2200 ipm, pressing speed of 200 ipm, and a return of 2200 ipm. Three motors provide a total of 75 hp at

Close up showing one of the unique feeding devices that are built into the Clearing double end presses. Parts are fed into the press through the chute. The chute aligns the parts in a position to receive the punch. Pneumatically operated pawls hold the parts in the chute until the punch returns to starting position. When the part is properly aligned, it engages a limit switch that permits the punch to operate.

1200 rpm. There are also three pumps utilized that have a total capacity of 77 gpm. Clearing Machine Corp.

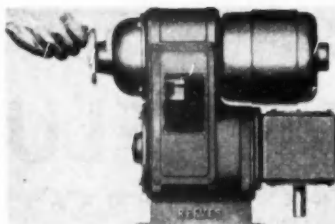
Circle E-7 on page 65 for more data



Clearing double end hydraulic horizontal press equipped with special automatic feeds, specifically designed for handling cartridge cases.

Variable Speed Right Angle Drive

The addition has been disclosed of a fractional horsepower Vari-Speed Motodrive with right angle reducer to a line of variable speed drives and controls. The Motodrive with right angle reducer combines any standard NEMA frame, type "C," face-mounted motor; the speed-varying mechanism; and the right angle worm gear reducer. This right angle reducer is



Reeves right angle drive.

available on all fractional horsepower Motodrives in either horizontal or vertical models; with speed ratios from 2 to 1 through 10 to 1.

Handwheel control is standard on these drives but electric remote and mechanical automatic controls can be applied. Reeves Pulley Co.

Circle E-8 on page 65 for more data
(Turn to page 62, please)

Are high capacity and long service life important?

*here's how truck and trailer manufacturers
get them with **NEEDLE BEARINGS***

Many leading truck and trailer manufacturers specify Torrington Needle Bearings for steering and brake assemblies because of their high radial load capacity and their long service life.

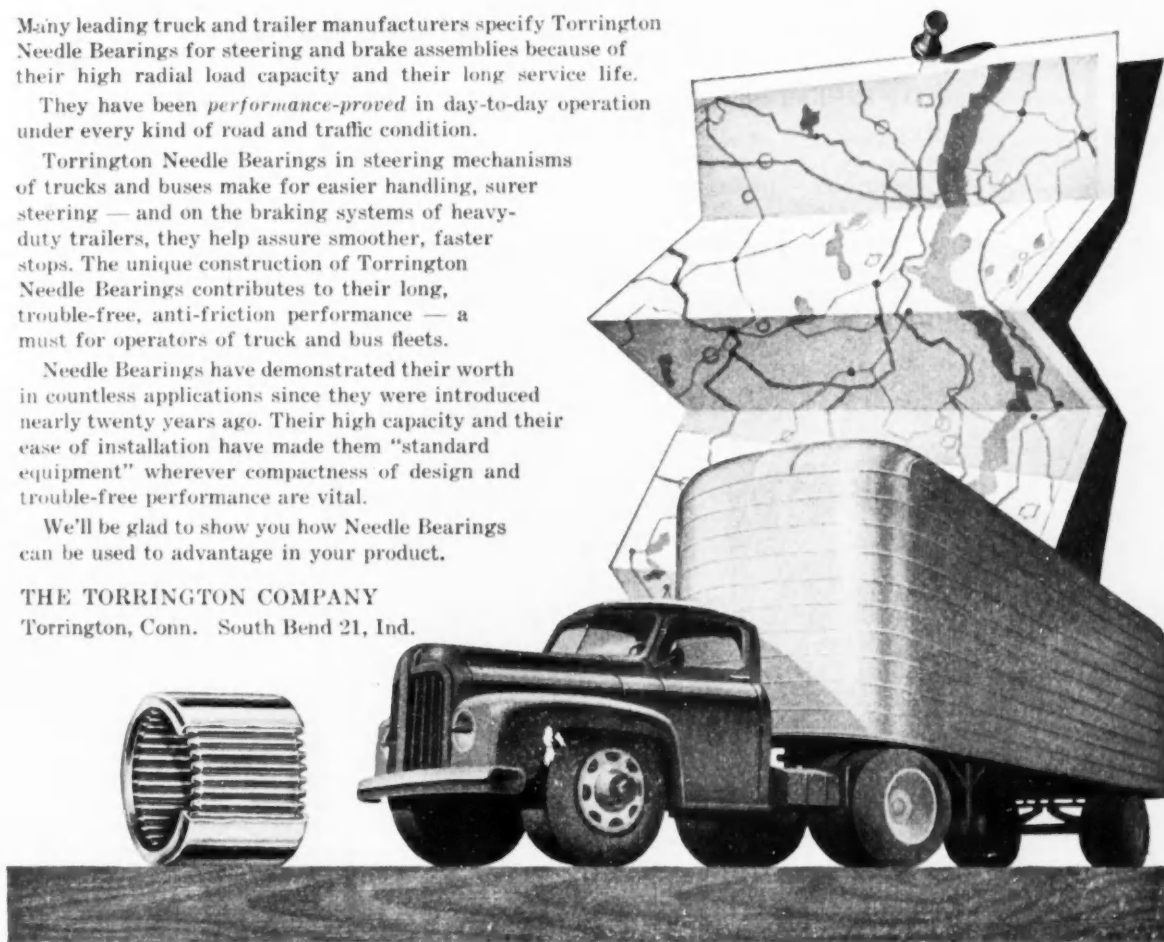
They have been *performance-proved* in day-to-day operation under every kind of road and traffic condition.

Torrington Needle Bearings in steering mechanisms of trucks and buses make for easier handling, surer steering — and on the braking systems of heavy-duty trailers, they help assure smoother, faster stops. The unique construction of Torrington Needle Bearings contributes to their long, trouble-free, anti-friction performance — a must for operators of truck and bus fleets.

Needle Bearings have demonstrated their worth in countless applications since they were introduced nearly twenty years ago. Their high capacity and their ease of installation have made them "standard equipment" wherever compactness of design and trouble-free performance are vital.

We'll be glad to show you how Needle Bearings can be used to advantage in your product.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers



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(Continued from page 60)

Large Capacity Drilling and Tapping Machine

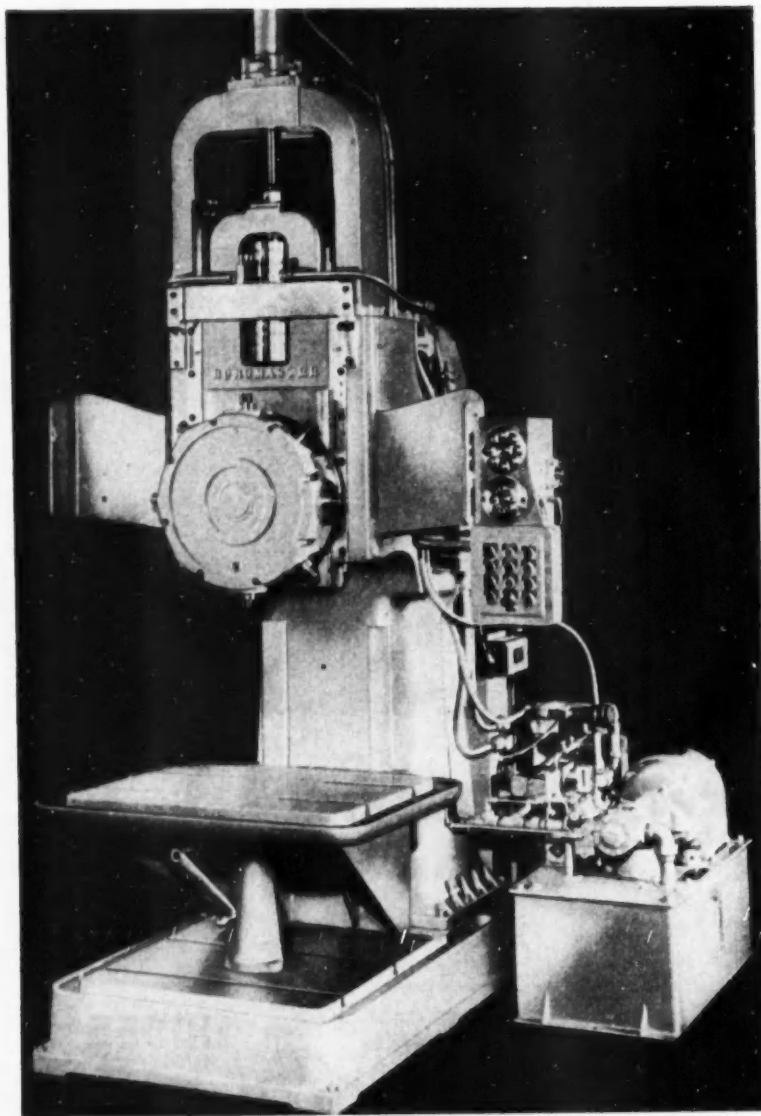
Now available is the Burgmaster Model 3-BH eight-spindle, automatic, hydraulic drilling and tapping ma-

chine. This automatic, hydraulic drilling and tapping machine has the following features:

1. Large throat clearance and table area.
2. Long spindle travel.
3. 1½ in. drill capacity in mild steel.
4. 12 in. spindle and head travel.
5. 19 in. table travel.
6. 17½ in. throat clearance.
7. Table work surface—36 in. wide by 35 in. deep, with "T" slots.
8. 10 hp., two-speed motor, U. S.
9. Timken bearings on spindle.
10. 12 preselective spindle speeds from 167 to 1765—four to each spindle.
11. Infinitely variable, preselective spindle feeds.
12. Automatic cycling through any or all stations with rapid approach, feed, dwell, slow feed out, and rapid traverse out, preselective for each spindle.
13. Button controls for set-up and hand operation.
14. Accurate depth setting and control.
15. Spindle runout held to 0.002 in. on 24 in. diam circle.
16. Skip indexing from spindle to spindle.
17. Vickers hydraulic unit.
18. Allen Bradley electrical controls.
19. Warner Electric clutch unit.

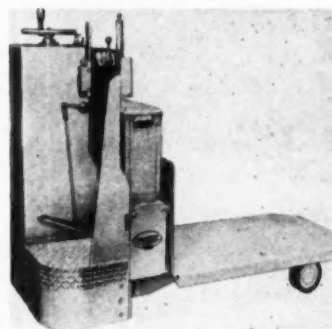
The 3-BH Burgmaster can be used on straight drilling operations, or on forming tools for I.D. or O.D. turning, tapping, threading, plunge cut end milling, large counter-boring, and spotfacing, and any other second operation. *Burg Tool Co.*

Circle E-9 on page 65 for more data



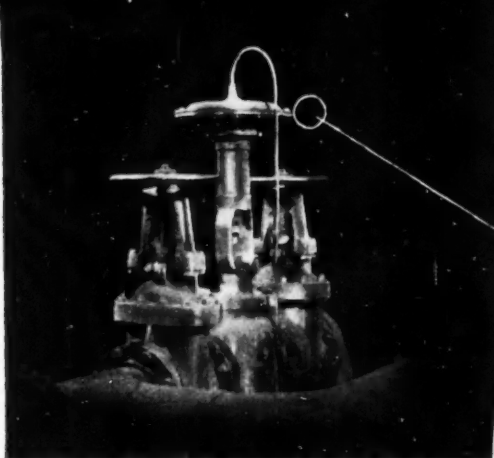
Burg drilling and tapping machine.

Platform Truck



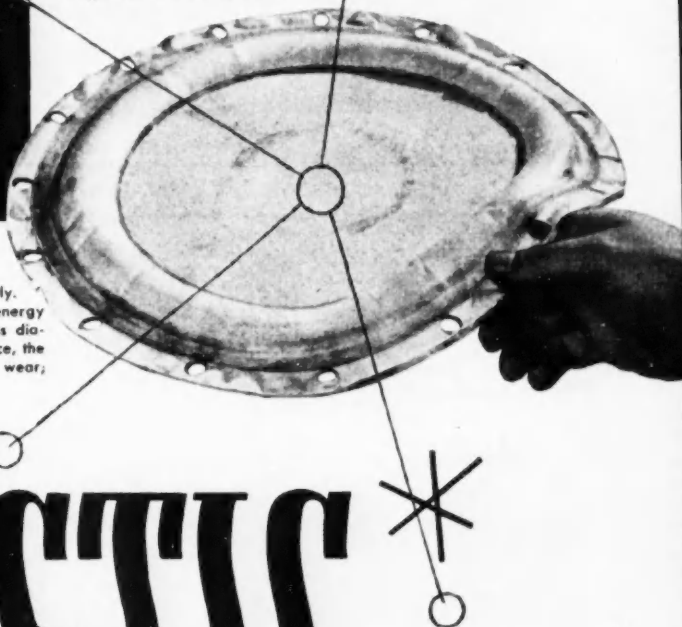
Transveyor, a riding-type electric platform truck, that is currently in production, is said to permit six-ft aisle operation. This lightweight materials handling unit, with 4000-lb capacity, comes in six, seven, nine, or eleven-in. platform heights; platform lengths vary from 36 to 72 in., overall length from 61 to 97 in. All *Transveyors* feature four-wheel construction with compensating suspension. (*Automatic Transportation Co.*)

Circle E-10 on page 65 for more data



**As a valve diaphragm at +100°F
SILASTIC outlasts heat-stable
organic rubber 7 to 1**

The diaphragm in this valve that regulates the intake to a boiler feedwater storage tank, is in almost constant motion 24 hours a day at temperatures well above 100°F. Successive synthetic rubber diaphragms lasted 7, 11 and 13 months respectively. That's unsatisfactory performance in a power house supplying energy to a large chemical plant. So they tried a Silastic coated glass diaphragm. Recently inspected after more than 78 months of service, the Silastic diaphragm was still soft and flexible; showed little wear; appeared serviceable for many more months.



For maximum life and reliability

specify **SILASTIC** the durable silicone rubber

You, too, will find that Silastic will last longer and give you more reliable service in most applications where the life of organic rubbers is limited by high temperatures, oxidation or weathering. You will also find that Silastic can be used in many cases to take the place of complicated mechanical devices made necessary by the relative instability of organic rubber.

And Silastic is in a class by itself among rubbery materials. For example, we have aged typical samples of a Silastic stock for 12 months in an air circulating oven at 350°F. After such accelerated aging, those samples showed an increase in hardness of only 18 points from

46 to 64 durometer; elongation went down from 320 to 105%; tensile strength dropped only 26 points from 557 to 531 p.s.i.; and there were no significant changes in any of their dielectric properties.

And that is almost incredible performance at temperatures high enough to change any other kind of rubber to a brittle, noninsulating material in a few hours or days at the most. When you need rubbery properties or good dielectric properties in a resilient material that will withstand weathering or long exposure to temperatures above or below the limits of ordinary rubbers, specify Silastic.

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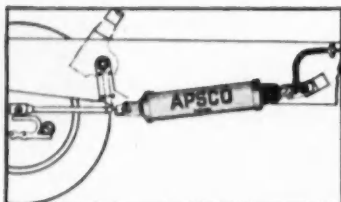
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NEW

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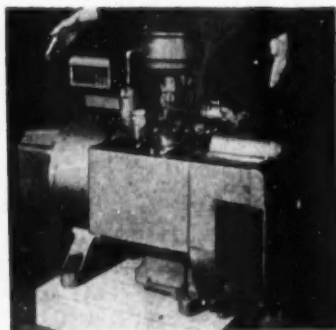


Steering Device for Commercial Vehicles

Recently marketed is an automatic steering device which is said to utilize compressed air to supply power for easy steering on all commercial type vehicles. Known as the Power Steer Booster, the unit is constructed mainly of anodized aluminum.

It is claimed that the device requires only a few fittings for quick installation on old or new vehicles without altering or removing any part of the steering mechanism. *Air-O-Matic Power Steer Corp.*

Circle P-5 on page 65 for more data



Air-Cooled Electric Generating Plant

Recently announced is an air-cooled, gasoline-powered electric generating plant. A vacuum cooling system is said to employ a powerful centrifugal blower to draw cold air through the generator and over the engine, and at the same time discharges heated air out of an eight-in. by 12 in. side vent.

Designated the CW model, the plant is now being produced in 5000-watt and 10,000-watt capacities. It is claimed to incorporate rather unique

engineering and design principles.

Due to their high output per pound weight and small size, the plant is reportedly highly suitable for mobile and portable uses. Readily trailer mounted, or carried on small pickup trucks, the units furnish ample power for floodlights, tools, and other needs.

Engines are two-cyl, four-c type in a power range of 13 to 20 hp. *D. W. Onan & Sons, Inc.*

Circle P-6 on page 65 for more data



Power-Driven Truck Roof Ventilator

Recently introduced is a power-driven roof ventilator for panel delivery trucks. It reportedly serves to pressurize the interior of the truck body and prevent dust and dirt from entering through cracks around doors and windows. A constant supply of clean air and the removal of stagnant air are said to be assured.

Mounted in the roof near the front of the truck, the ventilator delivers 200 cu ft of air per minute. It weighs

eight pounds and is adaptable to either six- or 12-v electrical systems.

The ventilator can be quickly dismantled by removing four screws. It is 6 1/4 in. deep, 15 in. long, and 11 in. wide. The loured ventilator cowl protrudes only three in. above the roof of the truck and is said to be installed so that the fan side is flush with the truck ceiling. *Evans Products Co.*

Circle P-7 on page 65 for more data



Soldering Iron with Thermostatic Control

Recently introduced is an instant-heat soldering iron without the use of a transformer. Known as the Trig-R-Heat, the iron has a light, plastic gun-grip which is said to make it easy to handle and aim.

Heat is controlled by thermostatic action to prevent iron from getting too cool for efficient soldering, or too

hot for tip safety and reliable work.

A switch-controlled spotlight reportedly makes interior soldering easier. The iron operates on 115-120 v, ac or dc. Wattage starts at approximately 400 w and idles at about 100 w. *Wall Manufacturing Co.*

Circle P-8 on page 65 for more data
(Turn to page 152, please)

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Hydraulic Presses

Bulletin No. 216 contains information on a series of single, double, and triple-action presses. Their construction details are analyzed. *Clearing Machine Corp.*

Circle L-6 on postcard for free copy

Optical Gaging

Now available is a 12-page booklet which describes advanced methods of optical gaging to cut inspection and tool-room costs. *Industrial Optical Div., Eastman Kodak Co.*

Circle L-10 on postcard for free copy

Heat Treating Controls

Vol. 12, No. 4 of "Comments" contains several items on practical applications of heat treating controls in various plants. *Wheeloo Instruments Div., Barber-Colman Co.*

Circle L-11 on postcard for free copy

Cutters

Catalog No. 60 I is a 72-page booklet dealing with inserted blade milling and boring cutters for all makes of equipment. *The Ingersoll Milling Machine Co.*

Circle L-13 on postcard for free copy

Transmission Equipment

Catalog No. R-103-A describes a line of power transmission equipment. The 36-page booklet is illustrated with diagrams and charts. *Rockwood Pulley Manufacturing Co.*

Circle L-15 on postcard for free copy

Fork Lift Trucks

Now available is a brochure on the FT Series of Diesel or gas-powered fork lift trucks. *The Buda Co.*

Circle L-16 on postcard for free copy

Drill Press

Recently released is a brochure on the Alfing Model BK 25 heavy-duty drill press. *Kurt Orban Co., Inc.*

Circle L-17 on postcard for free copy

Pillow Block

Bulletin No. A-620 presents features of the Dodge-Timken pillow block. *Dodge Manufacturing Corp.*

Circle L-18 on postcard for free copy

Metal Parts

Now available is a catalog listing small precision metal parts. *Specialties Div., The Torrington Co.*

Circle L-19 on postcard for free copy

Diesel Engine

Bulletin No. 1614 contains complete specifications on supercharged Model 6-DAS-516 in the Dyna Swirl line of Diesel engines. *The Buda Co.*

Circle L-20 on postcard for free copy

Fasteners

Catalog No. 1252 covers a line of fasteners for industrial applications. *Simmons Fastener Corp.*

Circle L-21 on postcard for free copy

Anniversary Booklet

Ferm No. 152, published on the company's 25th anniversary, describes briefly some of its major products. *Young Radiator Co.*

Circle L-22 on postcard for free copy

Testing Machines

Bulletin No. 4204 describes and illustrates improved models of 60-H and 12-H universal testing machines. *Baldwin-Lima-Hamilton Corp.*

Circle L-23 on postcard for free copy

Automatic Press

Vol. 3, No. 7 of "The Denison Press" features the automatic Multipress. *The Denison Engineering Co.*

Circle L-24 on postcard for free copy

(See preceding page)

Diesel Engine

Bulletin No. 1617 describes Model 135-DKBS Diesel engine with an exhaust turbocharger system of supercharging. *Waukesha Motor Co.*

Circle L-14 on postcard for free copy

Automatic Turret Lathe

Bulletin No. 145 covers Model 3U Speed-Flex automatic turret lathe for high-speed production of small parts. *Potter & Johnson Co.*

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P-6 P-12 P-18 P-24 P-30

2/19/53

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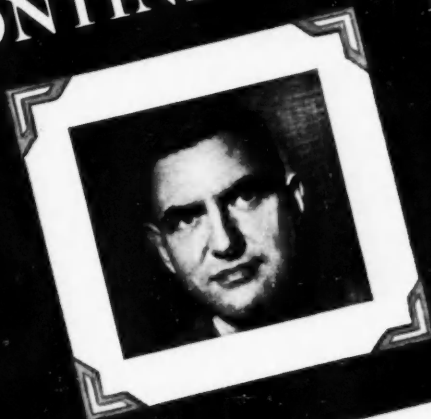
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(State)

(Zone)

CONTINENTAL'S PROOF BOOK



W. N. LARKIN
Amherst College, B.A., 1917.
Joined Sargent and Company
1949 as Assistant Superinten-
dent in Lock Division. Became
Purchasing Agent 1951.
Active member of National
Purchasing Agents Associa-
tion; Executive Associates
Forum; Quinnipiac Club;
N. H. Country Club.

SARGENT & COMPANY
INCORPORATED 1924
MANUFACTURERS
NEW HAVEN 9, CONNECTICUT

December 15, 1952

Continental Screw Company
New Bedford, Massachusetts

Gentlemen:

This is the time of the year when we take inventory. It has always been my practice to take "inventory" of our suppliers and see how they have shaped up and what kind of a job they have done for and with Sargent & Company over the past 12 months. It is certainly a pleasure to inform you that your performance has been among the best.

It is interesting to note that only a few short years ago you received your first order from us and that was for taped screws. Since that time, because of your performance and quality, you have grown to be one of our major sources for fasteners. When I asked myself why, the answer was clear. You have furnished us with a quality product at a fair price and completely fulfilled your obligation. Whenever we needed a little extra something you went out of your way to take care of our needs.

We sometimes forget that business isn't done primarily by companies but by the people who make up these companies, and your people have certainly made doing business with you a pleasure. It is my sincere hope that this fine relationship will continue to prosper and grow.

Cordially,

SARGENT & COMPANY

W. N. Larkin

W. N. Larkin,
Purchasing Agent

You too can count on Continental[®]™



Manufacturers of **HOLTITE** Fastenings For Every Purpose

CONTINENTAL SCREW COMPANY, NEW BEDFORD, MASS., U. S. A.

NEW

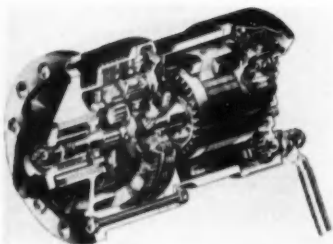


AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

Engine Starters

Recently announced is a series of aircraft engine starters for commercial airlines. Designated as the JH6C Series, the starters are said to have stronger components, greater resistance to vibration, wear and corrosion, and maintenance economy.



Jack & Heintz JH6C starter.

Three models are presently available: JH6CE for engines with a cu-in. displacement of 2650-3500 and a 5 1/4 in. bolt circle; JH6CF for engines with a 1000-2650 cu-in. displacement and a five-in. bolt circle; and JH6CP for engines with a 2650-4500 cu-in. displacement and a special gear ratio for higher jaw speed, for use on engines having a starter jaw-to-engine crankshaft gear ratio of 3:1. The latter ratio on engines using the JH6CE and JH6CF models is 1:1.

This new series does not render obsolete the JH6 starter series now in service. All JH6C parts are said to be interchangeable with their counterparts in the JH6 series, except the keyed-in-place sleeve bearings. Jack & Heintz, Inc.

Circle P-1 on page 67 for more data

Pump Control Valve

Model AA-40510, now available, is an 18-gpm pump control valve for use where it is desirable to unload pump delivery automatically at a low pressure into the suction side when oil temperature has reached a pre-

determined and reasonable maximum.

The design of the unit includes manual unloading of the pump. Maximum system pressure is said to be limited by a built-in relief valve.

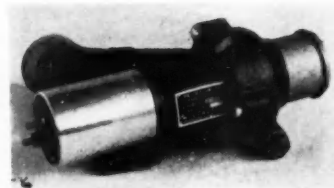
A pressure-actuated electric switch is provided for use in a signal system to flag system pressure changes. The pump shut-off manual control also serves as a firewall shut-off device. Vickers, Inc.

Circle P-2 on page 65 for more data

Fuel Vent Valves

Designed to safeguard fuel tanks against possible collapse or over-pressurization during extremes of high performance and/or tank purging, two fuel vent valves are now in production. One is fuel vent relief valve No. 5058, and the other is fuel vent and dive relief valve No. 5059.

Both valves are normally open. When the solenoid is energized, the pressure relief valve closes, but is free to re-open at a pre-determined



No. 5058 Carter fuel vent relief valve.

pressure, even though the solenoid remains energized. Such a normally open unit is said to provide: an open vent line for pressure fueling; sufficient clearance to avoid icing around the seat; and protection against failure in the event of electrical trouble in flight.

While the units are now being manufactured in two-in. size, the manufacturer is set up to produce in other sizes and to incorporate or engineer modifications for any special requirements. J. C. Carter Co.

Circle P-3 on page 65 for more data

Torque Link Steering Mechanism

Recently announced is a power steering mechanism to replace the conventional torque link in an aircraft nose strut. The device is said to accomplish space and weight savings by combining steering and normal shock strut torque link functions in a single, simple mechanism.

Steering force is accomplished by power cylinders which replace the upper torque link of the usual shock strut scissor, while the lower link remains essentially the same. The complete unit consists of such a power unit replacing the upper scissor, connected to the lower link at the knee, by a ball and socket coupling.

Control is provided by a control valve operated by the pilot. The same unit provides for shimmy dampening. It is claimed that the mechanism offers easy maintenance, due to the simplified design and accessibility in

its handy location on the nose gear.

When the plane is taking off, landing, or taxiing, the pilot need only to touch a small lever located on a control box at his side to set hydraulic forces in motion which will steer the airplane to the right or left or hold it steady for forward motion. Bendix Products Div., Bendix Aviation Corp.

Circle P-4 on page 65 for more data



Bendix steering unit.

Acceptance

Speaking of Chrome . . .

Sealed Power

Chrome-Faced

Piston Rings

are used

as original equipment by

leading

engine manufacturers

23

(yes, *twenty-three*)

Sealed Power Piston Rings

SEALED POWER CORPORATION • MUSKEGON, MICHIGAN

Sole manufacturers of KromeX Ring Sets, MD-50 Steel Oil Ring, Full-Flow Spring, Flex-S Flexible Oil Ring, and GI-60 Groove Inserts. Leading producer of Automatic Transmission Rings and Non-Spin Oil Rings.

Many New Features in IHC's R-Line of Trucks

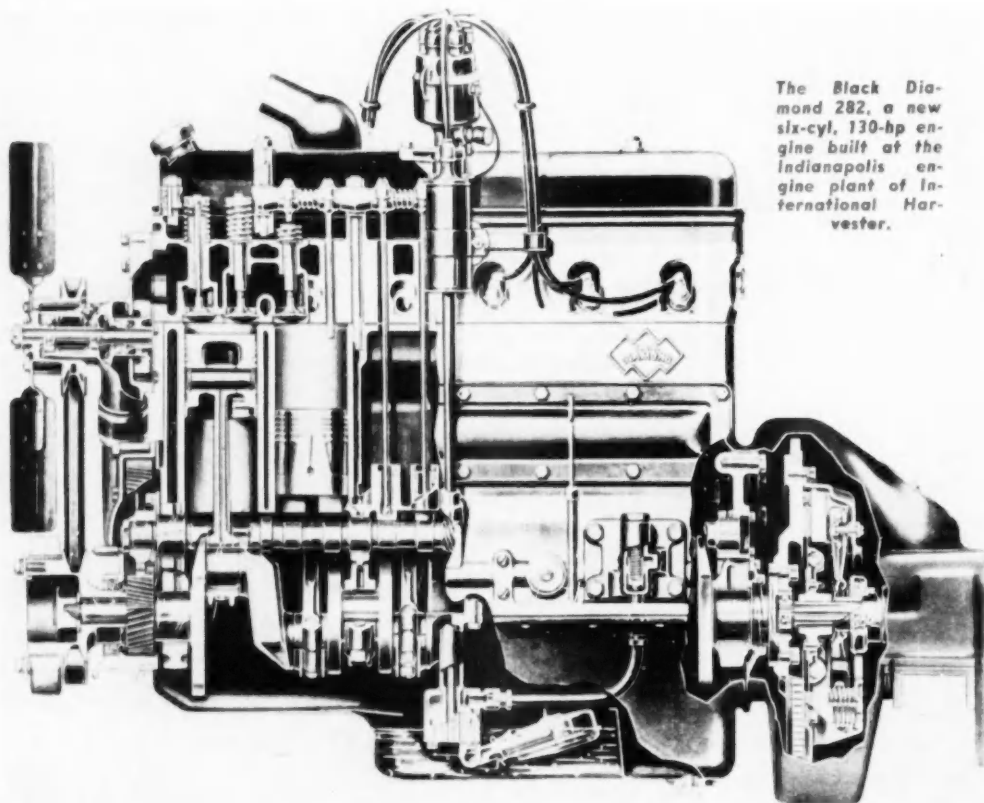
Model R-165 Roadliner, 130-in. wheelbase tractor shown with a 26½-ft semi-trailer, is one of the 168 basic truck chassis models introduced with the new R-line.



INTERNATIONAL Harvester Co. has introduced a new line of light, medium, and heavy-duty motor trucks with 168 basic chassis models and with gross vehicle weight ratings from 4200 to 90,000 lb. Many new features have been incorporated in the R line. Exterior styling has been redesigned. Front end sheet metal is more functional, permitting greater air intake for more efficient cooling. Green-tinted, non-glare safety glass is optional. Also, International trucks now are identified by the distinctive IH emblem, replacing the Triple-Diamond.

There are 29 engines—gasoline, LPG and Diesel—with horsepower ratings ranging from 100 to 356, and a wide

(Turn to page 98, please)



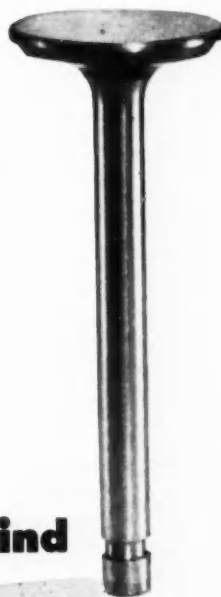
The Black Diamond 282, a new six-cyl, 130-hp engine built at the Indianapolis engine plant of International Harvester.



**Back of this
famous trademark . . .**



you'll find

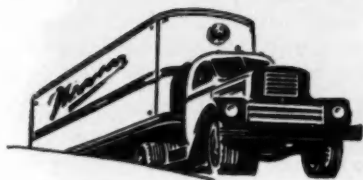
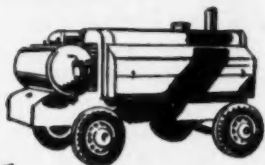


THOMPSON VALVES

CONTINENTAL MOTORS . . . builders of famous Continental "Red Seal" Engines . . . learned many years ago that they could with complete confidence turn their problems of valve engineering, design, and production over to Thompson Products.

Thompson Valves in Continental Engines are helping drive everything from aircraft to lawn mowers.

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VALVE DIVISION

Thompson Products, Inc.

CLEVELAND 17, OHIO



*Thompson-developed "Rotacaps"
and "Rotovalves" help increase
valve life hundreds of hours.*

AIR BRIEFS



By **ROBERT McLARREN**

Aircraft Big Business

The Munitions Board reveals that of the 100 biggest military contractors in the U. S., 39 are aircraft companies. Led by General Motors, General Electric and Chrysler companies in that order, the fourth largest producer is Boeing Airplane Co. with \$1,847,900,000 worth of business. Fifth place is United Aircraft Corp. with \$1,696,700,000 in contracts, followed by Douglas Aircraft Co. with \$1,511,500,000. Other "billionaire" aircraft companies include Republic Aviation, North American Aviation and Lockheed Aircraft. Pressing very close to the magical figure is Curtiss-Wright Corp., with \$990 million in contracts, principally for the British Sapphire turbojet engine. Oddly enough, a Canadian company, Canadian Commercial Corp., is among the top 100 U. S. arms producers.

Appropriations Slashed

U. S. Air Force and Naval Aviation will take a healthy cut in aircraft construction appropriation during the 1954 fiscal year, according to the President's budget request. The Air Force is cut from \$12.7 billion to only \$6.7 billion under the request, the Navy from nearly \$4 billion to only \$2.2 billion. However, actual spending for aircraft procurement during the 1954 fiscal year would actually rise to a new postwar high of about \$7 billion, compared to \$6 billion in the present fiscal year and only \$4.3 billion last year. This is due to the fact that the appropriations are for letting of contracts for future production, while the spending is to pay for contracts awarded over the past two years.

However, the President's budget, prepared by the previous administration, is probably due for some rough going under the new Republican administration. Chairman John Taber of the House Appropriations Committee is well aware that the armed forces are going to be able to spend only about \$42 billion of the \$46 billion provided them in the current fiscal year and he has no intentions of providing funds that the Defense Department finds unable to place with industry. The reduced aircraft procurement budget is in accord with the generally-recognized program of "leveling off" aircraft production at a rate of about 1100 airplanes per month. Thus, the slash will have no effect on current aircraft production but will merely stop the acceleration and expansion in order to maintain the industry at the 1100-planes-per-month

level. Under the new budget, the Air Force will reach 106 combat wings by June 30, 1953, 133 wings by June, 1954, and its long-planned 143 wings in 1955, although rising costs are threatening to cut this program by 10 wings unless additional money beyond the calculated program is made available. Navy and Marine Corps have already reached their 16 carrier air group planned strength and envisage no further expansion beyond the production of replacement aircraft.

Jet Transports

U. S. airlines and manufacturers, with the apparent exception of Boeing Airplane Co., continue to grow increasingly bearish on the subject of jet transports. Donald Douglas, president of the company bearing his name, recently told the Los Angeles Chamber of Commerce: "When we—and again I speak only for Douglas—are ready to deliver jet transports, they will be able to make money as well as headlines. Our airline operators prefer a few lines of small type in the income columns of the financial page to just big type on the front page." United Air Lines president W. A. Patterson echoed these sentiments in addressing the Investment Bankers Association when he said: "Only 13 per cent of our traffic goes over 1500 miles," in posing the difficult problem of producing a short-range jet transport. Patterson pointed out: "The jet liner will cost about \$4 million and any airline or manufacturer who makes a mistake in its selection of the type of plane is apt to go bankrupt." Meanwhile, Boeing Airplane Co., only U. S. builder to have a jet transport under construction, still does not have an airline customer for it, although the Air Force plans to purchase it as a jet refueling tanker.

Missile "Progress"

The Nazi V-2 rocket missile has just passed its tenth anniversary since its initial firing against London and all known V-2's captured intact (including parts) after V-E Day have now been expended by Air Force tests in New Mexico. Commenting on the occasion, a noted missile engineer had this to say: "If we had decided to produce a missile in quantity five years ago, we would have had to select the V-2. If we want

(Turn to page 123, please)

OVERSPEED GOVERNORS and CIRCUIT CONTROL GOVERNORS

(Adjustable While Running)



PROTECT your engine and equipment from damage caused by overspeeding.

This INSURANCE costs so little for its protection that no power plant should be without it. Since 1932, SYNCHRO-START GOVERNORS and CONTROLS have been in use all over the world protecting and controlling power plants and many other types of machinery where circuits are to be made or broken at pre-determined speeds.

Write for bulletin No. 409 describing these proven controls. You can depend upon their rugged construction, design, and our many years' experience in this field. If you are a buyer of engines, specify SYNCHRO-START to your engine manufacturer. He will be glad to supply you with the controls best suited to meet your demand.

DC SOLENOIDS 6V-12V-24V and 32 Volts

(Continuous Duty)

This LITTLE GIANT is doing all sorts of jobs on engines and many kinds of machines. It has a ten pound pull and a half inch stroke.

It has many uses and can be used any place where an operation is desired. It is used for operating throttles, fuel pump racks, chokes, anti-Dieseling devices, valves, switches, and many other uses where automatic or remote control is desired.

Write for bulletin No. 410 describing this rugged control or for our latest catalog covering our complete line of SYNCHRO-START Automatic Controls which have been in use for the past seventeen years. You can't go wrong with SYNCHRO-START.



SYNCHRO-START PRODUCTS, INC.
Automatic Engine Control Equipment

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The BUSINESS PULSE

Manufacturers of Consumer Durables Foresee Excellent Sales Prospects for Most of 1953. Basic Commodity Prices Still Unstabilized. Farm Program is Big Problem Confronting Congress at Current Session.

This Survey Is Prepared
Exclusively for AUTOMOTIVE
INDUSTRIES by the Guaranty
Trust Company of New York.

Business Continues at High Levels

There has been little change in the general business situation thus far in the new year, and business continues to hold at the high levels attained in the final quarter of 1952. Manufacturers of durable goods still have a substantial backlog of orders on their books, investment expenditures are being maintained, and there is some indication, although as yet inconclusive, that consumers are beginning to spend a little more freely from current income. Moreover, it is quite obvious that the business community by and large is well pleased with the actions and statements of the new Administration, and this undoubtedly has contributed something to the prevailing buoyancy.

The demand for steel has shown no perceptible let-up, and some producers report that incoming orders against second-quarter allotments have been substantially above previous expectations. Many manufacturers of consumer durables believe they see excellent sales prospects for the better part of 1953 and have stepped up their production rates in accordance with this view.

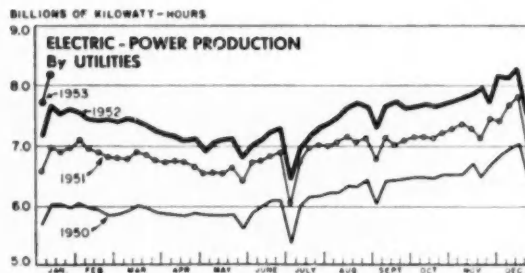
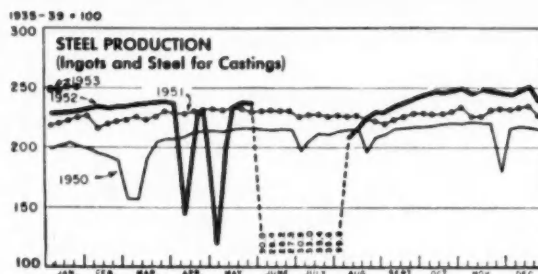
The automobile industry is the outstanding example of this situation and has been working hard in the early weeks of the year to place a large supply of new models in the hands of dealers. January production schedules for the industry called for the assembly of 481,000 cars and 111,000 trucks, as compared with a total of only 390,000 cars and trucks a year earlier. Other users who are currently taking all the steel they can get include the oil and gas industry, television and radio manufacturers and farm-implement makers. The steel companies are not accepting orders beyond the second quarter, but it appears that many consumers would place orders that far ahead if permitted to do so.

Retail trade during the early part of the year has been featured by favorable response to post-holiday clearances and special promotions. During the first three weeks of January department store sales for the nation as a whole were moderately above the level in the same period a year earlier. Fairly large gains in some sectors of the country were largely counterbalanced, however, by a seven per cent drop in sales in the New York Federal Reserve district, where a bus strike in metropolitan New York was an adverse factor.

The improvement in sales volume of department stores and other retail outlets throughout the nation as a whole is primarily a reflection of the recent high levels of national income and employment, although,

(Turn to page 126, please)

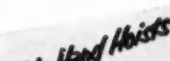
Selected Business Indicators



Source: U. S. Dept. of Commerce

IT'S YOURS FOR THE ASKING

The selection of just the "right" Yale Hoist to fit your needs is the most important and the first step in insuring that you get what you really need. In choosing equipment, Yale Hoists are sold exclusively through Industrial Distributors, and these are fully trained and fully qualified to survey your operation. They will recommend the equipment that is best for you, the most economical, efficient use of your staff in the operation and organization. Details on the operation and organization of Industrial Distributors will be found on the inside back cover of this book.



that mean time, work and money-saving
efficiency for every user in every industry

VALE HOIST FEATURES	CABLE RING ELECTRIC HOISTS	MIDRIST RING ELECTRIC HOISTS	LOAD RING ELECTRIC HOISTS
	Capacity to 15 tons	Capacity to 2 tons	WHL RING TYPE Capacity to 1 ton
Enclosed air-lifting	✓	✓	✓
Totally enclosed oil-sealed motor	✓	✓	✓
Magnum - automatic control		✓	
Automatic drum control	✓	✓	✓
Roller chain lift			✓
Drive rope lift			✓
Alloy steel 100 ton chain	✓	✓	✓
Close mesh positive lubrication	✓	✓	✓
Non-Expanding slip joint barrow load handle	✓	✓	✓
Worm wheel - chrome nickel drive forged steel	✓	✓	✓
Slender load rack steel safer grip	✓	✓	✓
Alloy steel lubrication	✓	✓	✓
Slender frame with positive lubrication	✓	✓	✓

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SAE Papers

(Continued from page 49)

In designing the stressed parts of the engine for minimum weight, consistent with adequate fatigue life, full advantage was taken of the fact that an automobile engine operates most of the time at part throttle. In any of the short stroke-large bore engines the calculated gas pressure loads and stresses are extremely high, and the

inertia loads are correspondingly low. Luckily, experience has shown that even under severe road testing, fatigue life of the parts is more dependent on the inertia loading than on the gas pressure loading. This result is largely explained, of course, by the relative number of cycles of each type of loading which the engine undergoes in road operation.

In establishing the endurance standards for the new Buick engine we took the position that while the engine must be capable of withstanding our

standard full throttle high speed dynamometer test, and not less than 200 hours of full throttle power development running, the true gage of engine life was to be the behavior on the road.

The production built Buick V-8 engines are 170 lb lighter than the 1952 Roadmaster engines (see table).

In addition to the compact design features discussed previously, the old standard design proportions and running clearances were re-examined, and where practicable, revised to save space. For instance, a very small length-diameter ratio of the piston, and its 1/16 in. running clearance with the counterweights aided in reducing the height and width of the crankcase.

The Buick V-8 engine is 4 in. lower and 13½ in. shorter than the Roadmaster 1952 straight eight engine.

Twelve Volt Electrical System

The present trend toward higher volumetric efficiency and higher compression ratios has created a problem for the electrical engineers. The required ignition voltage (Fig. 1) has now become of such a magnitude, that the secondary voltage obtainable with a six volt primary system is closely approaching the minimum firing voltage of the spark plugs, even under optimum conditions.

Several attempts which have been made in an effort to increase the secondary voltage while retaining the six volt primary system have met with at least a temporary success. However, in view of the ever increasing secondary voltage requirements, Buick has decided that the most satisfactory long range solution was the adoption of a system with a higher primary voltage, and has adopted the twelve volt electrical system on the V-8 engine for 1953.



We have to degrease a variety of metals that's why we use **BLACOSOLV® (the highly stabilized solvent)**

BLACOSOLV gives you greater stability with its neutral stabilizers. Does the job Safely . . . Quickly . . . Economically. Cleans all metal or combination of metals—will not stain or dull even the most highly polished surfaces. It's the one price solvent for all metal degreasing jobs. "We have to degrease a variety of metals. That's why we use highly stabilized solvent".

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TORONTO 13, ONTARIO

NIAGARA-METAL PARTS WASHERS—built to fit your needs

Coating Steel by the Aldip Process

By D. K. Hanink and A. L. Boegehold
Research Laboratories Div. General Motors

DEVELOPMENT of an economical and commercial process for aluminum coating steel assemblies (chart, p. 78) has led to the engineering acceptance of a variety of parts. Work has progressed along the lines for which Aldip (see July 1, 1952 issue, AUTOMOTIVE INDUSTRIES) was originally designed, namely corrosion resistance in exhaust systems at locations where leaded fuel exhaust gas condensate tend to collect and for



Forged-in Quality means Longer Life for Eaton Valve-Seat Inserts

Eaton steel valve-seat inserts are made from hot-upset and pierced blanks. The forging process improves the physical characteristics of the steel, and provides superior wearing qualities in the finished inserts.

The Eaton Saginaw Division is equipped by years of experience, and modern specialized equipment for the high-volume production of seat inserts in all types and sizes—iron and steel, puddled or plain—for aircraft, motor cars, trucks, tractors, and Diesel engines.



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MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO

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"CHICAGO" precision valve gear parts



- Steel
- Cast Iron
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Hydraulic Tappets • Mechanical Tappets • Roller Followers • Push Rods • Self Locking and Standard Thread Adjusting Screws • Valve Spring Retainers • Split Valve Locks • Rocker Arm Shafts •

Connecting Rod Bolts • Hydraulic Cylinder Pistons
Cylinder Head Studs • Cylinder Head Cap Screws
Main Bearing Studs • Main Bearing Cap Screws
Flywheel to Crankshaft Screws • Diesel Energy Cells
Wheel Bolts and Studs • Differential Carrier Screws
Oil Pump to Distributor Shafts • Remote Control Levers
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Special Screw Machine Parts $\frac{1}{16}$ " to 8" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products.

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2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

SAE Papers

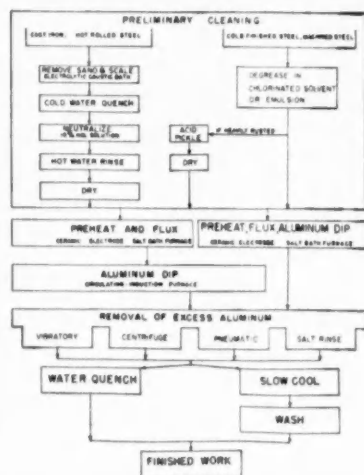
(Continued from page 76)

other parts requiring high temperature oxidation resistance up to 1600F.

Typical of such parts is the military tank heat exchanger which operates at a maximum temperature of 900F. ALDIP coated assemblies have performed satisfactorily in field service resisting corrosion at the exit tank ends where exhaust gas condensate collects. Replacing type 321 stainless steel in this assembly produces a considerable saving in strategic chromium and nickel with additional cost savings realized in the case of fabrication of SAE 1010 steel.

Other typical examples of maintenance or replacement parts requiring a combination of oxidation and corrosion resistance are ALDIP coated and diffusion heat treated exhaust pipe adapters for trucks. The adapter is installed in the truck exhaust system in front of the muffler where temperatures are high and exhaust gas condensate collects and requires the post diffusion heat treatment for optimum performance.

Fig. 1

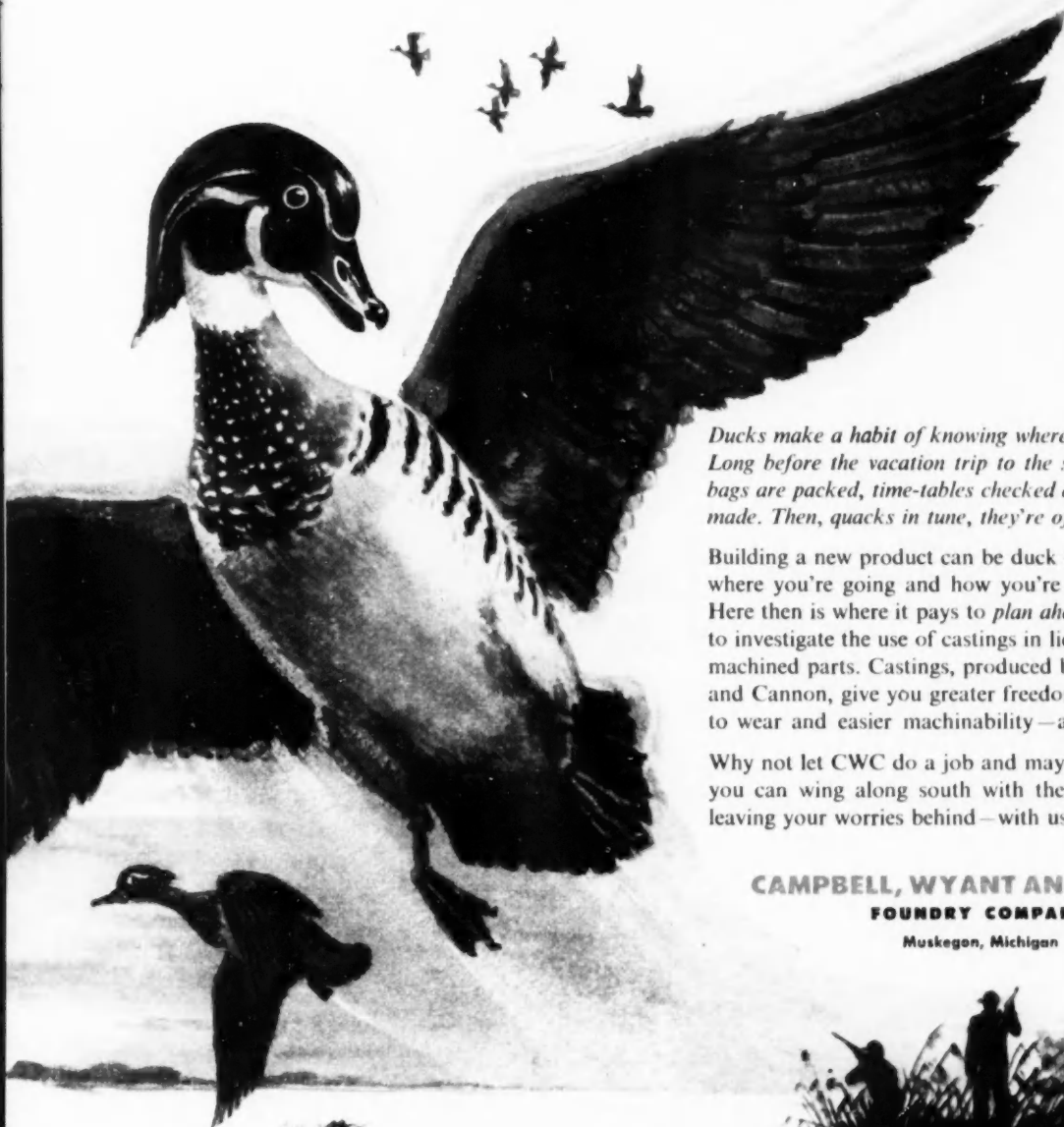


Flow chart of Aldip aluminum coating process.

Heat treat fixtures such as liners for furnace trays, hooks for salt bath heat treating, or the spacer supports for carburizing side gears perform satisfactorily under this type of service condition.

Parts requiring similar service for tank operation are the heat exchanger

YOU'LL NEVER SEE
a duck flying blind



Ducks make a habit of knowing where they're going. Long before the vacation trip to the sunny clime, their bags are packed, time-tables checked and reservations made. Then, quacks in tune, they're off.

Building a new product can be duck soup when you know where you're going and how you're going to get there. Here then is where it pays to *plan ahead*... taking the time to investigate the use of castings in lieu of more costly machined parts. Castings, produced by Campbell, Wyant and Cannon, give you greater freedom of design, resistance to wear and easier machinability—all at much less cost.

Why not let CWC do a job and maybe next time you can wing along south with the ducks, leaving your worries behind—with us.

CAMPBELL, WYANT AND CANNON
FOUNDRY COMPANY
Muskegon, Michigan

CWC

Since 1908

tailpipe tubes which have been given military acceptance. The aluminum coated pipes comprise only part of the full assembly which utilizes high exhaust gas temperatures to heat the tank compartment.

Fabricated SAE 1010 manifolds of the type used in Diesel engines are proving satisfactory in the field and replace type 321 stainless steel. An exhaust manifold of this type is shown in figure 28 saving 2.5 lb of nickel and 4.5 lb of chromium.

Simplifying Fuel Injection

By Vernon Roosa

Hartford Machine Screw Co.

THE Roosa-Master fuel injection pump, which has been under continuous development since its conception in 1939, combining an enormous amount of bench tests, dynamometer tests with engines, and road tests with vehicles powered by Diesels, is a single cylinder, opposed plunger, in-

let metering type pump which meters and permits the liquid fuel to be sprayed into an internal combustion engine without the use of bearings, valves, complicated springs or gears. It lubricates itself with the filtered fuel it pumps. This pump accomplishes the required function with a relatively small number of comparatively simple parts, and it has the same number of parts regardless of the number of cylinders it serves. The important components are shown in the sectional drawing (Fig. 1) and their functions are as follows:

The distributor rotor, which rotates in the hydraulic head, is driven on the flanged end in proper timed relations by the drive shaft. Threaded into the other end is the transfer pump rotor which contains the vanes for the primary pump. In the core of the shank section is an axial passage into which fuel flows from the metering valve through inlet holes and which itself leads to the cylinder in the flanged end. The cylinder contains two opposed pump plungers actuated simultaneously by the rollers riding



AIRCRAFT
GENERATOR
TESTER
SUN model AGT-2

Especially designed to comply with United States Air Force Specification MIL S-7223, this unit will test 28-volt aircraft and similar DC generators with output capacities up to 600 Amperes and speed ranges from 2000 to 11,600 RPM.

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... for special-order, built-to-specification scientific test equipment ... Sun Electric Corporation is the world's largest manufacturer of Automotive and Aircraft Electrical and Electronic Testing Equipment, supplying approximately 70% of the testing equipment of this type to U.S. automotive dealers. That is why the leaders in every branch of the industry look to Sun as the logical choice to design and build special scientific equipment to meet their particular testing needs. The unit pictured is an example of a test problem solved with such specially designed equipment. Other Sun special-order units are in use in car, truck and tractor factories, aircraft and ordnance plants and in the factories of engine and component parts manufacturers everywhere. In production testing, spot checking and in quality control of material these special Sun Testers offer a high speed simplified operation that will save thousands of dollars and many production headaches.



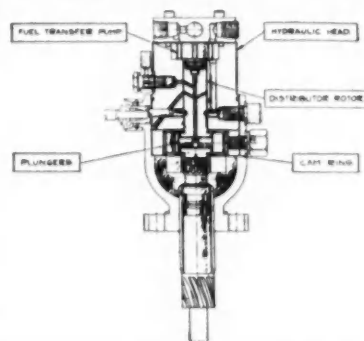
DON'T GUESS-TEST! Sun Engineers will be glad to discuss the design of special test equipment that can solve your testing problems too! Write TODAY for the Sun SPECIAL TEST EQUIPMENT Catalog.

SUN Equipment is available
in 6-12-24 volt units.



SUN ELECTRIC CORPORATION
6373 AVONDALE AVE., CHICAGO 31, ILLINOIS

Fig. 1

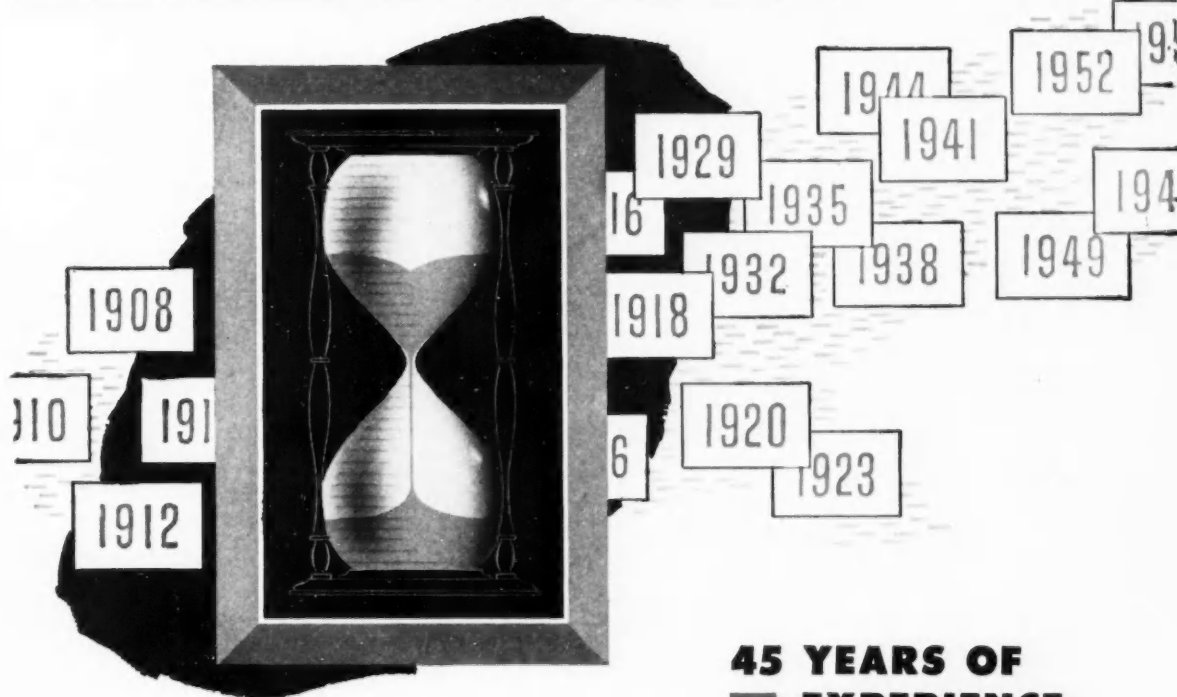


Sectional drawing of Roosa-Master fuel injection pump.

in their shoes, guided by two slots, over equally spaced opposite internal cam lobes in the cam ring.

The hydraulic head contains as many fuel line connections and drilled passages leading from the distributor rotor as there are cylinders in the engine but there is only one outlet hole in the shank of the distributor rotor. Also, the cam ring has as many op-

FUNDAMENTAL FACTORS IN EQUIPMENT LEADERSHIP



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SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM PUMPS (Combination)
• FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—AIR (Pressure)
• GAUGES—GASOLINE • GAUGES—OIL (Pressure) • GAUGES—TEMPERATURE (Water,
Oil) • OIL FILTERS (Lube) • PANELS (Instrument) • SPARK PLUGS • SPEEDOMETERS
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Spare parts and supplies packaged in cans made under MIL-C-12147 and MIL-C-5405 meet all the requirements of Method 1A and Method 1C, Unit Packaging, under MIL-P-116A. This packaging is approved and currently in active use by most of the technical branches of the service.

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Cleveland Container Canada, Ltd., Prescott, Ontario • Offices in Toronto and Montreal



SAE Papers

(Continued from page 80)

positely spaced cam lobes as there are cylinders in the engine.

The end plate serves to provide fuel passage to and from the pump and protects it by regulating the pressure. It also provides a means by proper porting and spring arrangement of by-passing the primary pump when necessary to prime the filter.

The fuel entering the pump is drawn from the supply tank through the filters by a vane type pump which is interposed between the distributor rotor and the end plate. It is carried around the primary pump and forced down the drilled passage of the hydraulic head under pressure. It then flows around the annulus of the rotor shank to the metering valve, which controls the quantity entering to the plunger cylinder when the charging port in the rotor comes into register with the passage from the metering valve. The fuel forces the plunger outward in proportion to the quantity being injected on the following stroke.

It is noteworthy to mention that all the fuel entering the pump cylinder is injected into the engine on the following stroke of the pump plunger. As the charging port passes out of register from the passage from the metering valve, the fuel is momentarily trapped.

Further rotation of the rotor causes the outlet port of the rotor to come into register with the discharge port in the hydraulic head at which time the cam rollers rise toward the center of the cam, forcing the pump plungers together which causes fuel to be ejected from the pump to the injection line leading to one of the injection nozzles. It should be noted that the fuel can pass through the passage from the metering valve into the axial passage of the distributor rotor only when one of the charging ports is in register; also that the discharge of fuel from the pump cylinder and thence into the engine occurs only when the charging ports are out of register and the outlet port is in register.

The maximum quantity that may be injected into the combustion chamber on each pump stroke as recommended by the engine builder is set by limiting the outward travel of the cam roller shoes, which in turn limits the outward movement of the pump plungers. This is the only adjustment that can be made on the pump.

(Turn to page 85, please)

Superior

TYPE 430

STAINLESS STEEL

The Heart of the Lighter

FOR HEAT RESISTANCE
RESISTANCE TO CORROSION
EASE OF FABRICATION
UNIFORM HIGH QUALITY

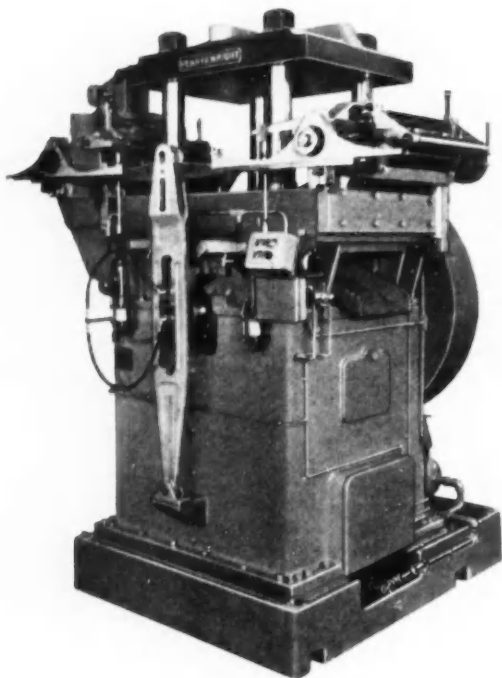
This Superior lighter has a stainless steel body that never gets its surface "ruined" by rust or corrosion. It is made of valuable 430 Stainless, the lightest and strongest, always retains readily the fitting, is unaffected by heat or flame, and fulfils completely its function. It is completely rust resistant, meets with Type 430 in specified dimensions and finishes. Send us your inquiry.

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CORPORATION

CARNEGIE, PENNSYLVANIA

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NEW CATALOG Up-to-the-minute facts on Dieing Machines. Capacities now range from 25 tons to 2500 tons. Catalog gives specifications up to 400-ton machine. Write Henry & Wright, 491 Windsor St., Hartford, Connecticut.



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TYPICAL JOBS THAT SHOW A PROFIT AT EVERY STROKE



Automotive stamping produced complete per stroke from $\frac{5}{32}$ " thick by 13" wide hot rolled steel in coils on 200-ton Dieing Machine, single gear type, equipped with progressive die. Speed approximately 45 strokes per minute.



Ball bearing retainer produced complete in 75-ton Dieing Machine operating at speed of 95 strokes per minute. Made from $4\frac{1}{8}$ " wide by .034" thick cold rolled steel.



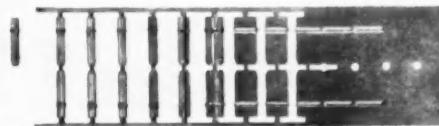
Ferrule. One completed piece produced per stroke in 50-ton Dieing Machine operating at speed of 90 strokes per minute. Made from $\frac{9}{16}$ " diameter by $\frac{7}{8}$ " long by .030" thick cold rolled steel.



C-Clamp Frame. Both halves produced complete in 150-ton Dieing Machine operating at speed of 65 strokes per minute. Material—cold rolled steel .086" by $4\frac{1}{8}$ " wide.



Support bracket produced complete one per stroke in 150-ton Dieing Machine operating at speed of 60 strokes per minute. Made from .062" thick by $7\frac{1}{4}$ " wide cold rolled steel.



Radio tube prong produced complete in 25-ton Dieing Machine at rate of 450 pieces per minute. Made from brass .012" by $1\frac{1}{16}$ " wide.



Bathroom fixture produced in 60 ton Dieing Machine operating at speed of 110 strokes per minute. Made from .032" thick by $1\frac{3}{4}$ " wide cold rolled steel.



Hardware item. One completed piece produced per stroke in 100-ton Dieing Machine operating at speed of 75 strokes per minute. Made from 3" wide by .040" thick cold rolled steel.

AUTOMOTIVE INDUSTRIES, February 15, 1953

SAE Papers

(Continued from page 82)

Measuring Rate of Fuel Injection in an Operating Engine

By R. J. Wehrman, H. R. Mitchell
and W. A. Turunen
Research Laboratories Div., General Motors

BASICALLY our method of measuring rate of fuel injection treated the spray tip holes as a flow metering element. The injection pressure versus time curve was measured by means of a strain gage for a representative cycle from which the fuel injection rates were obtained using a suitable pressure versus fuel flow rate calibration.

The strain gage method of measuring fuel injection rates has several advantages and disadvantages when compared with the rotating receiver method in which rate of fuel injection is measured by passing a series of collecting cells under an injector nozzle during the injection period. The apparent advantages of measuring fuel injection rates by the method presented are as follows:

1. More comprehensive data are obtainable. In addition to fuel injection data, information may also be obtained on injection pressures, injection timing, and check valve vibrations. The cause and effect relationships existing between these variable may be studied;
2. It can be used in an operating engine or on bench test setup;
3. Transient pressure changes may be observed and studied;
4. No changes in the fuel flow passages of a standard injector is required.

The disadvantages of this method are as follows: 1. It is more complex and less direct than the rotating receiver method; 2. It requires the use of a high pressure pump if injection pressure data are desired; 3. Installation of the strain gage requires skilled personnel.

Low Temperature Sludging Test

By J. G. McNab, M. E. Cunn,
D. S. McArthur and K. L. Stehle
Standard Oil Development Co.

THE Standard Oil Development Company has developed a new test for evaluating the sludge handling ability of lubricants. This oil sludging test measures the sludge handling

ability of lubricants in terms of the time required to reach 50 per cent oil screen plugging in cyclic laboratory engine operation. The manner in which sludge builds up in this test is similar to the way it builds up in field engines. Results correlate very well with those obtained in low temperature, stop-and-go field service.

The test conditions were chosen after studying the conditions found to be conducive to sludge formation in the field. A six-cylinder, overhead valve engine is modified by enlarging the piston ring gaps to increase blow-

by. It is then run in four hour cycles. Each cycle includes 1½ hours of idle with 115 F oil temperature and two hours of loaded operation with 180 F oil temperature. This is followed by a ½ hour shutdown under old conditions. Periodic inspections of the oil screen are made as the test progresses and the per cent oil screen plugging is plotted against time. Lubricant sludging "Life" is the time required to reach 50 per cent plugging. Comparisons between lubricants are made on the same fuel.

(Turn to page 86, please)

Traction and Power to



Plow Right Thru Drifts

ALLIS-CHALMERS tractors are rugged enough to absorb the shocks and stresses met in all kinds of road maintenance. Heavy-duty ROCKFORD CLUTCHES help them move maximum size loads thru tough going — with ample margin of safety. Let ROCKFORD clutch engineers help you design dependable, flexible controls for your machine's powerline.

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315 Catherine Street, Rockford, Illinois, U.S.A.

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"PRODUCTION-DESIGNED FOR YOUR ASSEMBLY LINE"

SAE Papers

(Continued from page 85)

Titanium Alloys for Aircraft Engine Forgings

By **L. R. Frazier**

General Electric Co.

TITANIUM alloys available in bar and billet form are conveniently segregated into three types: (1) low strength alloys produced by melting sponge titanium of various grades without further additions, (2) medium strength titanium alloys made by adding metal and interstitial elements during melting, and (3) the high strength titanium alloys with larger quantities of metal additions.

In all of the three groups of forging alloys, low strength, high strength, and medium strength, the forgeability is about equal. None of the alloys has any marked advantage over the others in scaling. All must be limited in heating time to prevent formation of a hard, brittle, crust under the scale. All are subject to surface imperfections which must be removed before finishing forging. The same defects may be found in bars and billets on each of the titanium forging alloys.

When forging organizations have obtained further experience with titanium alloys and have adequate technical staff to control the wayward tendencies of this juvenile metal, they find the titanium alloys suitable for forging. Nearly any shape that can be forged in steel can likewise be forged in titanium by practical means.

Future developments in titanium forging alloys will probably introduce several modifications of the present series. Improved purity of the titanium sponge will improve both ductility and impact properties. We hopefully anticipate a group of so-called alpha titanium alloys which will provide medium high strength and weldability. Continuing progress from the present high level of titanium technology assures success in the application of low, medium, and high strength titanium alloys to an endless variety of forgings for aircraft and ordnance.

(Turn to page 88, please)

Read **AUTOMOTIVE INDUSTRIES**

AMERICAN CHEMICAL PAINT COMPANY

AMBLER



PENNA.

Technical Service Data Sheet

Subject: Protecting Aluminum with "ALODINE"®

INTRODUCTION

Aluminum not only corrodes when exposed unpainted to the atmosphere (particularly in moist, salt-laden air or industrial fumes) but also sheds paint unless the surface is actually changed prior to finishing. Simple treatments involving cleaning, or etching, or both, which heretofore have been used extensively, do not change the chemical composition of the surface and are inadequate. Far from retarding the corrosion of unpainted aluminum, such processes may in fact stimulate it.

In general, coatings integral with the aluminum itself have proved to be far more effective than cleaning and etching treatments for bonding paint and protecting the metal. "Alodine", which forms a stable, durable, non-metallic surface on aluminum, anchors the paint finish, prolongs paint life, and protects aluminum exposed unpainted in moist and salt-laden atmospheres.

ALODIZING IS EASY AND EFFECTIVE

The Alodizing process is a chemical one and does not require electrolytic techniques or equipment. Alodizing is simple, foolproof, low in cost, and requires a minimum of equipment. Essentially, the process consists of the following easily controlled operations or steps:

1. Cleaning the work.
2. Rinsing the cleaned aluminum surfaces.
3. Coating with "Alodine."
4. Rinsing with clean water.
5. Rinsing with warm "Deoxylyte" (acidulated rinse).
6. Drying.

After treatments. Alodized aluminum provides an ideal bonding surface for paint, wax, adhesive, or other organic finishes. These should be applied in accordance with the manufacturer's directions. Unpainted or exposed areas will be protected by the tough, durable "Alodine" surface.

CHARACTERISTICS OF THE "ALODINE" COATING

TYPE	Non-metallic surface, integral with aluminum it protects.
COLOR	Depending on alloy treated, color range is from an iridescent blue-green to a dark slate grey.
THICKNESS	From 0.01 to 0.08 mil. No appreciable dimensional changes occur when aluminum is Alodized.
WEIGHT	50 to 300 mgs. per square foot. Optimum: 100 to 200 mgs. per square foot.
SOLUBILITY	Insoluble in water, alcohol, solvents, etc. Insoluble in most dilute acids and alkalis. However, strong acids and alkalis which attack aluminum may penetrate the "Alodine" film and react with the underlying metal. Slightly soluble in concentrated nitric acid. Soluble in molten sodium nitrate, etc.
ELECTRICAL RESISTANCE	High dielectrical resistance.
HEAT STABILITY	Unimpaired at temperatures that melt aluminum.
FLEXIBILITY	Integral with and as flexible as the aluminum itself. Can withstand moderate draws.
ABRASION RESISTANCE	Approximately 90% of that provided by chromic acid anodized aluminum.
SALT SPRAY	Painted—superior to chromic acid anodizing. Unpainted—comparable with chromic acid anodizing.
PAINT-BONDING	Excellent. Equal to or superior to anodizing.
TOXICITY	Non-toxic.
BIMETALLIC CORROSION RESISTANCE	Shows good resistance against bimetallic or galvanic corrosion.

"ALODINE" MEETS SERVICE SPECIFICATIONS

"Alodine" applied by immersion or spray complies with the rigid performance requirements of both industrial and Government specifications. The following is a list of Service Specifications which "Alodine" meets at the present time.

MIL-C-5541	U. S. Navord O.S. 675
MIL-S-5002	16E4 (SHIPS)
AN-F-20	AN-C-170 (See MIL-C-5541)
	U.S.A. 72-53 (See AN-F-20)

BRUSH "ALODINE" PROTECTS ALUMINUM IN THE FIELD, SHOP, OR HANGAR

Brush "Alodine" is easily applied in a simple brush-on or flow coat process to large assemblies and surfaces—airplanes, trucks, trailers, boats, housing, building siding, railway cars, bridges, etc.—that are too bulky or too remote to be conveniently treated in tanks or a multi-stage power spray washer. The cleaning and coating chemicals for Brush Alodizing are shipped in bulk or in the convenient Brush "Alodine" Chemical Kit No. 1. This Kit contains enough chemicals to treat about 1,000 square feet of surface and is an ideal package for use at airfields of commercial airlines or of the Armed Services anywhere.



WRITE FOR FURTHER INFORMATION ON "ALODINE"
AND ON YOUR OWN ALUMINUM PROTECTION PROBLEMS.



SAE Papers

(Continued from page 86)

Titanium and Other Alloys in Corrosive Environments

By W. Lee Williams

U. S. Naval Engineering Experimental Station

IN most corrosive chemicals, titanium and type 316 corrosion resistant steel run neck and neck with one important exception. Titanium is definitely superior to resistance to solutions of chlorine, chlorides and dilute hydrochloric acid. In seawater environment titanium is even immune

to the conditions which cause pitting of type 316 steel; stagnation, in crevices, under fouling organisms, and under moist salt crystals. Although titanium must be classed among our best and most versatile corrosion resistant engineering materials, it is probably safe to say that corrosion

resistance will be a consideration, at least to some extent, in the majority of the applications for titanium and its alloys, since most applications for titanium will find it used in conjunction with other metals. Nevertheless, the engineer who pays heed to the few simple rules outlined here will rarely find himself in serious trouble from galvanic corrosion. Although titanium is cathodic to most of the common constructional materials, the galvanic corrosion problems associated with its use are not different from the problems encountered with such well-known alloys as monel and stainless steel.

Simple rules to minimize the effects of galvanic corrosion can be as follows:

(a) Select combinations of metals as close together as possible in the galvanic series. For example, titanium and type 304 stainless would work well together, but the coupling of titanium and aluminum could lead to disastrous effects on the latter material.

(b) Avoid making combinations where the area of the less noble material is relatively small. For example, a joint failure would occur many times faster with copper rivets in titanium plates than it would with titanium rivets in copper plates.

(c) Insulate dissimilar metals wherever practical. If complete insulation is not practical, it will be helpful to use paint or plastic coatings at joints if the circuit resistance can thereby be increased appreciably.

(d) Apply coatings on exposed surfaces with caution. For example, do not paint the less noble material without also painting the more noble metal. Otherwise, greatly accelerated local corrosion can occur by concentrating the galvanic current at coating imperfections on the less noble metal. It follows that coatings should be kept in good repair.

(e) When dissimilar metals are located remote from one another, but are connected by an external conductor, design the equipment to keep the metals as far apart as possible. The effect of this is to reduce galvanic current by increasing the resistance of the liquid path.

(f) If practical, add suitable chemical inhibitors to the corrosive solution.

(g) Avoid joining dissimilar metals with threaded joints, if possible. Threads are likely to deteriorate rapidly. Brazed joints are preferred, using a brazing alloy more noble than at least one of the metals to be joined. (Turn to page 90, please)



Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER

MOTORS

The wide use of Lamb Electric Motors in aircraft components, home appliances, portable electric tools and other portable devices is impressive evidence of the fact that they combine thorough dependability with low weight.

To obtain these and the other advantages of Lamb Electric specially engineered motors, it is important that the motor be considered while the product is still in the design stage.

The Lamb Electric Company Kent, Ohio

In Canada: Lamb Electric — Division of
Sangamo Company Ltd. — Leaside, Ontario

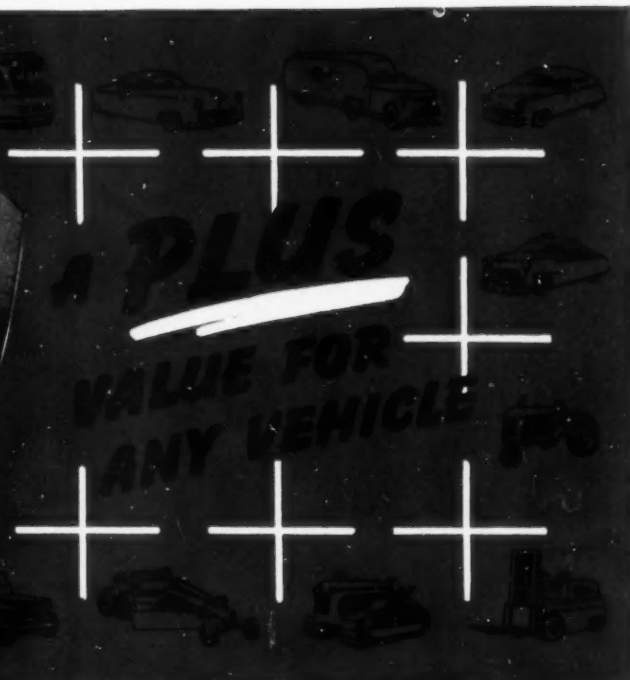
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Plus VALUE FEATURES

- T-shaped oil-impregnated bronze ball separator maintains perfect concentricity—eliminates eccentric thrust, excessive wear—assures the plus smoothness, quietness and endurance of bronze-to-steel contact.
- Large, factory-packed grease reservoir assures lifetime lubrication—no need for costly grease fittings or oil lines.
- Special construction locks shell to free race, forming leak-proof joint. Lubricant can't escape to clutch facings, never needs replenishment.
- Case hardened races for wear-resistant working surface and tough, elastic, shock-absorbing core.



Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Precision Parts.

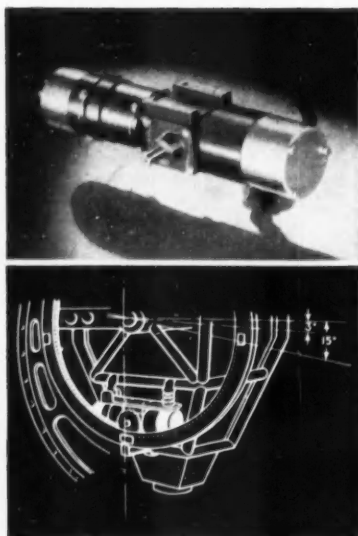
In 1953, as in the past 19 years more of the nation's mobile vehicles will be equipped with the Aetna T-Type clutch release bearing than with any other type. Its unrivaled service life has always made it the most economical in the long run. Once installed it is trouble-free, attention-free for vehicle life. Thanks to its design and lubricant capacity there's no need of costly machining operations for oil lines or grease fittings—no need for further maintenance whatsoever. Think what that saves in man and machine hours on the assembly line, in saving up-keep costs for the vehicle owner.

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Cameras on Reconnaissance Planes Airborne Actuated



The R-118M6 Rotorac[®] is used on the Grumman F9F-5P and the Chance Vought F7U-3P to position the photo reconnaissance cameras.

The Airborne actuator is mounted on the camera cradle and its pinion engages a stationary internal gear segment. Five camera positions are obtainable: 3° or 5° and 15° below horizontal on each side, and vertical. The two extremes are controlled by the actuator limit switches; the others by limit switches on the gear segment. Internal switches in the actuator sequence the limit switches to permit the desired relocation.

The R-118M6 is a modification of the Rotorac shown in the I. A. S. Aeronautical Engineering Catalog. We suggest you refer to this publication for data on this and other Airborne actuators.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue, Hillside 5, N.J.

SAE Papers

(Continued from page 88)

(h) Provide protective galvanic current, either from an external power source or from zinc, magnesium or steel consumable anodes installed within the system.

(i) Install replaceable waster pieces. If galvanic corrosion cannot be prevented, it is often possible to install a section of less noble material at the joints where galvanic contact occurs. Thus, nearly all attack is localized and restricted to the replacement item. For example, heavy wall steel nipples could be used between steel tubes and noble metal fittings in a piping system.

Titanium in Airframes

By F. Robert Kostach
North American Aviation, Inc.

IN our F-86 Sabre Jet models, the engine is enclosed by the fuselage and the aft fuselage section is the "hot" zone. Therefore, it is the area where titanium will be used. Basically the fuselage consists of a series of sheet

metal frames which run transverse to the line of flight. These frames are connected by longitudinal members called longerons and the whole is overlaid with a skin which is firmly attached to the skeleton structure to make a unified load carrying body. In the past 18-8 stainless steel has been used where the temperature was too high for aluminum and as more powerful engines were developed more and more stainless was required. Weight obviously was becoming a serious problem and fortunately titanium was "born" at a most opportune time. In addition to the structure, there are firewalls and other heat shields required to protect accessory equipment and mechanisms. Here strength is not as important as corrosion and heat resistance. Commercially pure titanium does an excellent job in these applications.

What the future of titanium in airframes will be is difficult to answer simply. The temperature effect of high speed is a problem in the foreseeable future with the skin of the airplane getting hotter. For example, at a speed of Mach 2 at 35,000 ft altitude, the calculated skin temperature approaches 600 F. The first is about the absolute limit for our current high

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FASTENERS . . . IT'S ALLMETAL**

ALLMETAL, Specialists in Stainless. Produce Stainless Products Exclusively

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SKF



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These big Gisholt No. 24 Hydraulics remove 34 lbs. of metal in two operations in a total of only 2.80 minutes' machining time on each of two machines. All cutting is on 52100 bearing steel and done at speeds of 325 to 350 f.p.m.

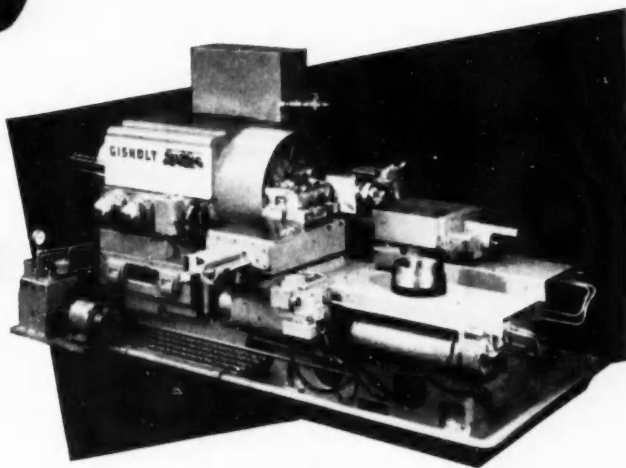
Speed is important, of course. But precision is the governing factor. How the Gisholt No. 24 does the job is a story that might mean real savings for you, too.

The No. 24 Hydraulic Automatic Lathe is a larger version of the famous No. 12 that has an outstanding success record on hundreds of jobs. If you have large volume precision work up to 24" diameter, the Gisholt No. 24 is the machine to investigate. Write for full information.

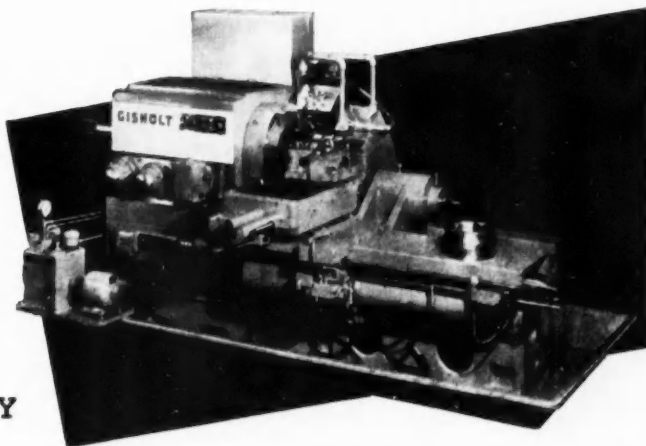
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



First Operation: Chucked on OD with 3-jaw hydraulic chuck, part is turned up to the jaws, faced, chamfered, bored and bore radius formed. Cam relief on rear tool block turns boring bit clear of workpiece as it is withdrawn.



Second Operation: Part held on expanding arbor by hydraulic pressure is finish turned, faced, chamfered and bore radius formed. Special rocker arm type carriage at rear tips in shaving tools to form both roller grooves with feed of .003" to .0045."

SAE Papers

(Continued from page 90)

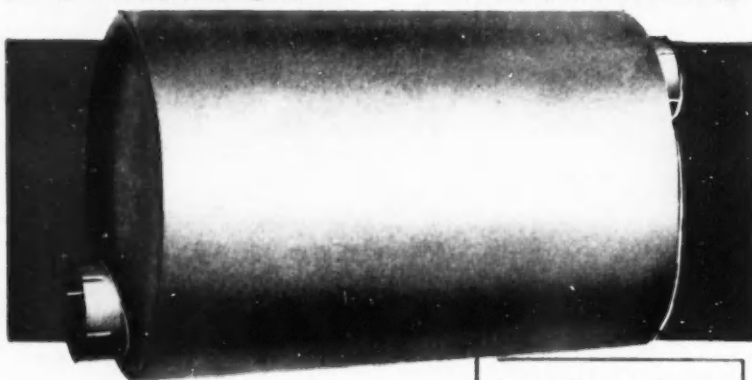
strength aluminum alloys and as the airplanes go faster the area of titanium use will expand to the forward fuselage and wings. Eventually it can be seen that the parts that are now titanium will require even a better heat resistant material, which we hope will be a new titanium alloy, and those which are now aluminum will require titanium.

It should not be overlooked, though, that on current designs especially in the commercial field, there are many places that titanium could be used if it could be economically justified. Lower cost per pound would mean more utilization.

New alloys and better production techniques can expand these futures and we are looking forward to the developments with much interest. It is reasonable that one or more of the new alloys, such as an all alpha alloy, will be completely weldable. At this time, extruding processes are feasi-

ble and this will increase titanium use in aircraft. Better rolling techniques will overcome one of our greatest headaches, non-uniformity of sheet material. However, even though we have not got everything we desire, we have used the current materials where they will do us some good. Our largest application at this time is about 600 pounds net part weight on one model, which represents an appreciable part of the total weight of the airframe.

Greater noise reduction — without back-pressure penalty wins Industry-wide acceptance for **Donaldson** HEAVY-DUTY **Mufflers**



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Two-Shaft Gas Turbine in Helicopters

By William B. Anderson
Boeing Airplane Co.

THE two-shaft gas turbine has much to offer the helicopter designer in his search for a powerplant with characteristics more suitable to the requirements of rotary wing aircraft. With the two-shaft turbine it is not necessary to compromise hovering performance, controllability and/or high-speed performance. The distinct advantages of the two-shaft turbine may be briefly summarized as follows:

1. Nearly full shaft power over the useful range of rotor rpm and increasing torque with decreasing rpm, providing rotor rpm stabilization, better handling qualities, and improved control.

2. A lightweight powerplant and a lighter installation by eliminating the clutch, cooling fans, and special cowls, resulting in increased payload and/or performance.

3. Improved flight performance including hovering, rate of climb, and ceiling.

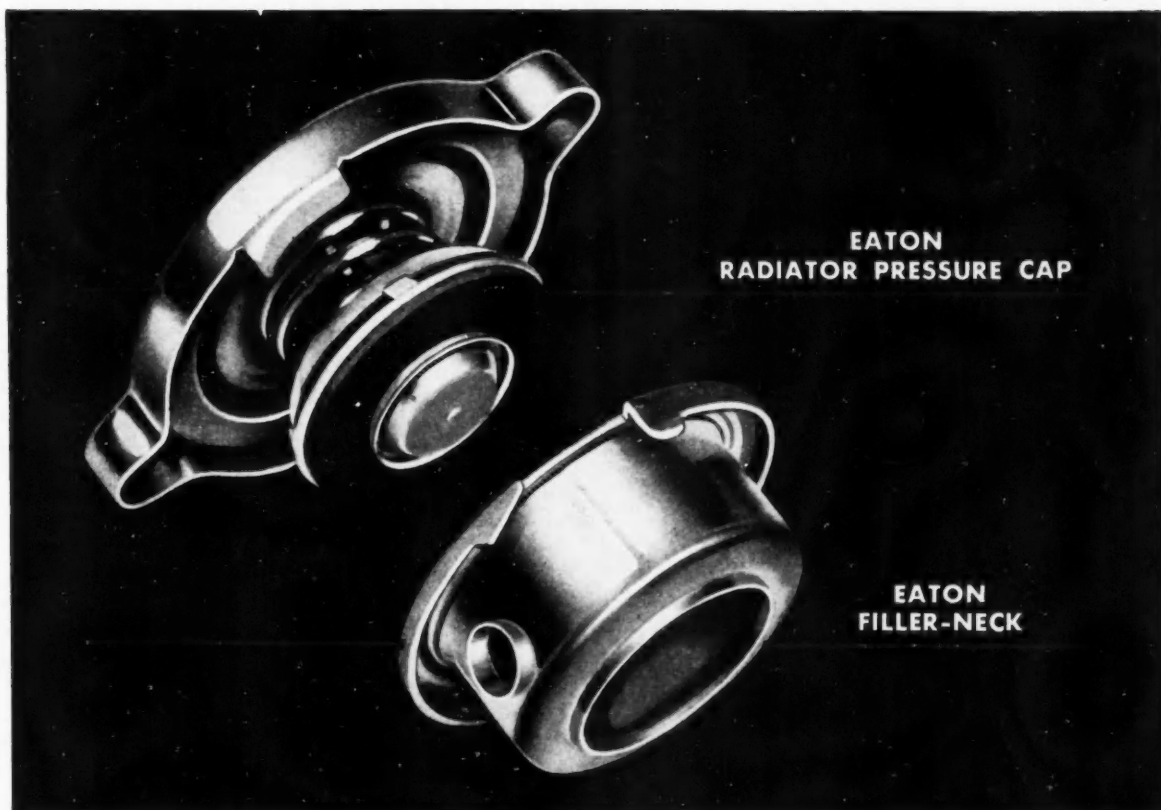
4. The ability to burn cheaper grades of fuel simplifies logistics, lessens fire hazard, and somewhat compensates for the high fuel consumption.

5. More crew comfort by reduction of noise level and elimination of engine vibration.

Only by further flight evaluation can the full possibilities of the two-shaft turbine in helicopters be completely explored. In the meantime, reliability is being increased and fuel consumption decreased.

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With a sealed cooling system vehicles can be designed with smaller radiators at considerable saving in cost.

Eaton offers the advantage of a single source of supply for pressure cap and filler-neck requirements; eliminates divided responsibility; assures positive mating of cap and neck; saves engineering and purchasing contact time. Eaton engineers will welcome an opportunity to work with you in developing the most efficient and economical closure—standard or pressure type—for your cooling systems.

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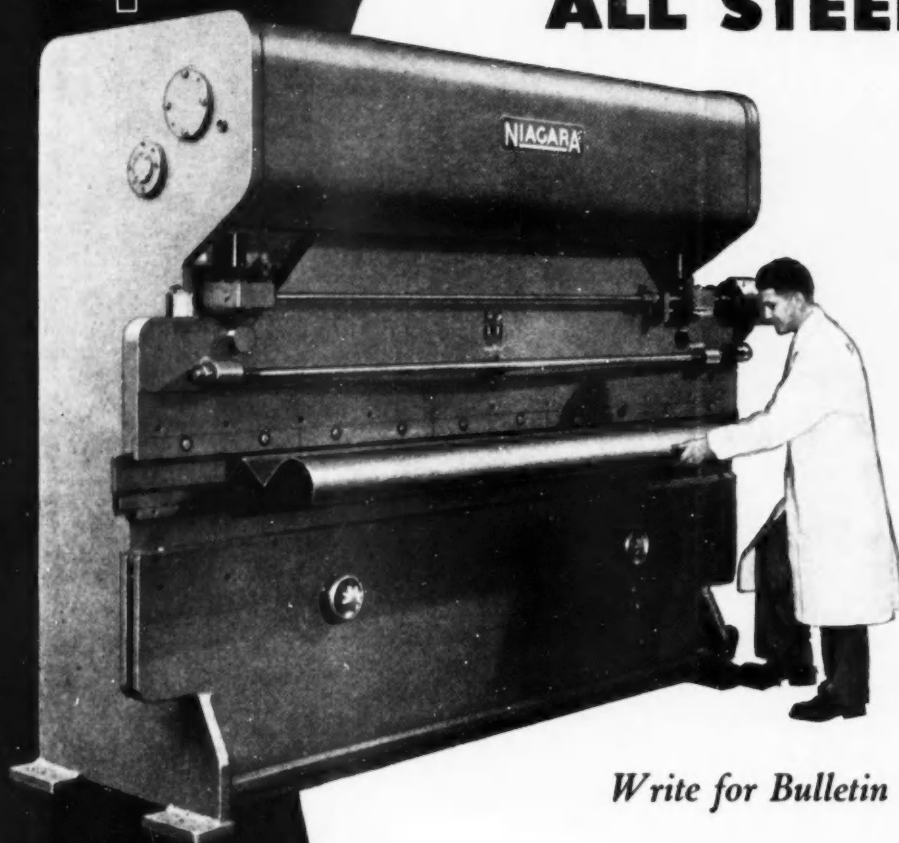
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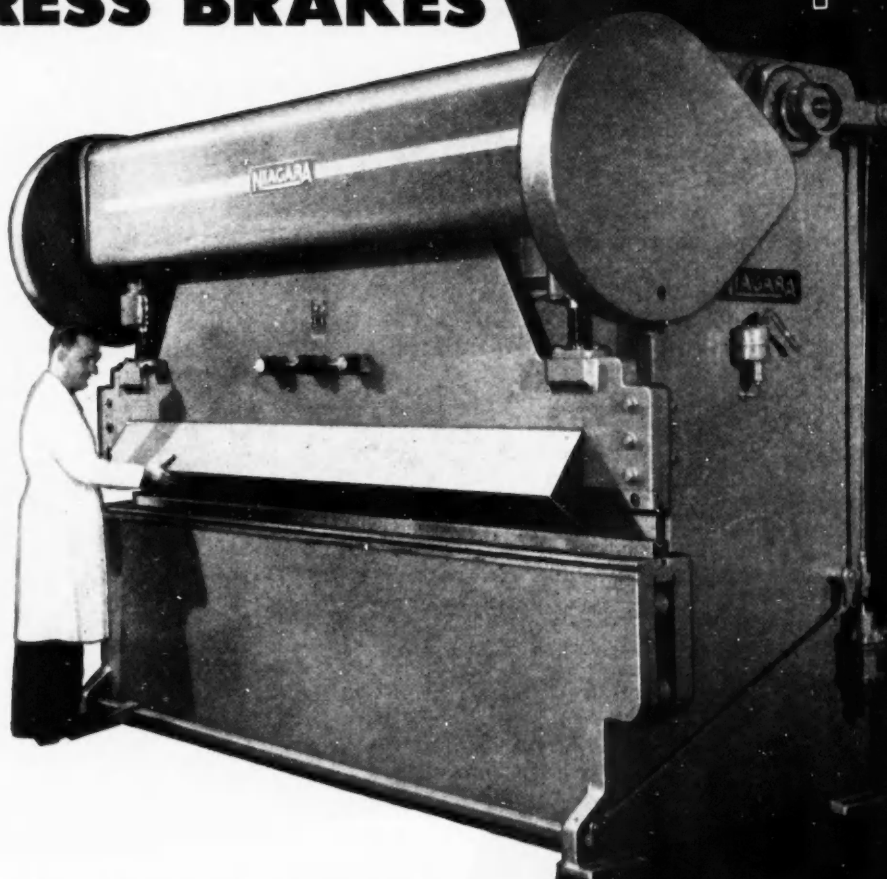
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Dodge Body Assembly

(Continued from page 33)

In order to weld the cowl side panel to the front pillar at the belt of the body, the welding guns utilized had to be designed so that they reach through a hole in the cowl lower panel.

Still proceeding along the major assembly line, the next four operations are centered around the roof panel. First, the outside surface of the roof side rail at the front is welded to the windshield opening side frame on both the right and left hand sides of the body. The flange on the roof side rail is then pinchwelded to the windshield opening side frame on the left and right. Thirdly, the roof panel assembly is welded to the front and rear roof side rails. Then, the roof panel is spot welded to the quarter panel at the coach joint.

Moving once again to the windshield area, the windshield lower frame to cowl side panel gusset is placed in the fixture on the right and a similar piece along with a wiring clip assembly is placed on the left side of the body. The flanges of the gussets are then welded to the two assemblies. Further spot welding is done on the flange of the windshield frame gusset to the roof side rail and windshield frame reinforcement.

Working on the roof section in the next sequence of operations, the front and rear headlining bow supports are assembled into position and welded to the roof side rails. Immediately after the foregoing work has been performed, the dash panel assembly is placed into position and securely clamped. The dash panel is spot welded to the cowl upper panel, cowl side panel, and floor pan. At this point two body bolt reinforcements are welded to their reinforcement braces.

Using a locating pin and clamp, the next parts to be assembled aboard the fixture on the conveyORIZED assembly line are the two hood hinge supports. These are welded to the cowl top panel reinforcement and cowl upper panel.

Proceeding along toward the end of the multi-operation line, the next piece to be assembled into the welding fixture is the rear shelf panel. This piece is welded to the center belt bar from the deck opening. The shelf panel also is welded to the side belt bar through various holes in the shelf panel assembly. It was for operations

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such as the one just described that Dodge engineered special heads for its welding guns. Gussets between roof rail and the rear window frame are next placed into position and pinch-welded to the roof rails, body lock pillar upper brace, rear window frame and side belt bar. Also the body lock pillar gusset is welded to the shelf panel for the final operation along the merry-go-round type assembly line.

An overhead hoist is brought to play to remove the body from the welding fixture and place it on the

table-height conveyor for operations on the underbody. Here work details include welding the inner wheelhouse panel to the underbody, welding the coach joint of the floor pan side to the underbody, and welding the flange of a bracket to the quarter panel floor pan extension gusset. From this point on through to final assembly, the operations resemble those carried out previously in the building of Dodge automobile bodies.

Besides the numerous spot welds made on the body throughout the preceding operations, the body receives

much other welding such as arc welding and gas welding to make a strong integral shell.

IHC Trucks

(Continued from page 70)

selection of transmissions, auxiliary transmissions, axles and axle ratios, available in the R-line models.

Besides its standard chassis models, the International R line includes a number of chassis series specialized for truck operations. Among these are:

Schoolmaster chassis models for school bus operation.

Roadliner models for tractor, semi-trailer operations over the highway.

Loadstar models for hauling heavy, compact loads over rough terrain.

Cab-Forward models for truck operations requiring the maximum in load-space and maneuverability.

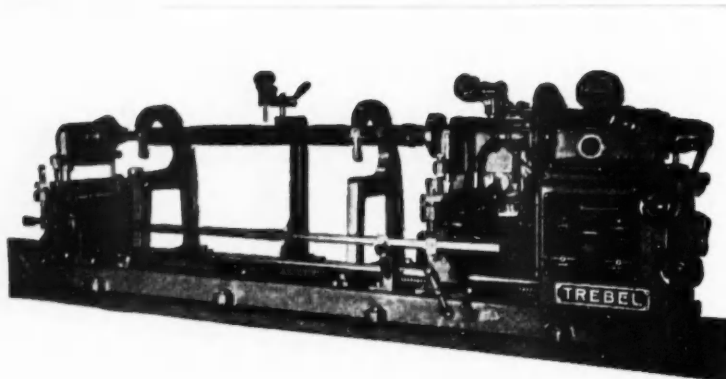
Six wheel truck models for on and off-highway operations.

Specialized fire truck chassis models.

Powering the new light, medium, and heavy-duty models are seven International valve-in-head engines, ranging from 100 to 162 hp. All are built at International's Indianapolis, Ind., engine plant. Six of the International-built engines are available with gasoline or liquefied petroleum gas fuel systems.

An all-new valve-in-head engine, the Black Diamond 282, a six-cylinder, valve-in-head, 130-hp unit for truck and highway tractor operation, has been introduced with the new R-line trucks. It is a 282.55-cu-in. displacement engines which provides 130.2 maximum bhp at 3400 rpm. Compression ratio is 6.5 to 1. The engine has 3 13/16 in. bore and 4 1/4 in. stroke, and develops 246.3 lb ft torque at 1800 rpm. The cylinder block is of chrome-alloy iron. A high alloy cylinder head incorporates large streamlined intake channels and ports. A new high-lift camshaft opens intake valves wider. Other features of the new engine include: Chrome-plated top piston rings; Slo-roto exhaust valves; downdraft type Visi-Flo carburetor; and intake valve stems equipped with neoprene seals.

The Black Diamond is available with gasoline or LPG fuel system. It will be standard equipment for RF-170 Series six wheel models (GVW 22,000 to 26,000 lb) and R-180 and RC-180 Series conventional and cab-forward models (GVW 17,000 to



Balancing this 60" propeller shaft is no trouble with a TREBEL

THE propeller shaft is first dynamically balanced by spot welding two compensating weights onto the shaft ends near the universal joints. The exact size and location of these weights is indicated by the machine. Shaft is then accelerated to its critical speed and amount of deflection read off a dial. A third weight is welded on in the middle of the shaft opposite the point of maximum deflection to insure a smooth running condition at all speeds.

A variable high speed control, free wheeling, safety latches and tachometer are provided for the spin test.

Shafts up to 96" long, weighing from 20-130 pounds are accurately

and quickly balanced in the TREBEL DEK 60e DYNAMIC balancing machine—also cranks, flywheels, electric armatures, etc. with a range of 20-260 pounds. Guaranteed accuracy is .1 ounce-inches or .00002 inches displacement of center of gravity.

Unique Balancing Principle using a counter force to compensate for unbalance eliminates complicated set-ups and makes possible the indication in simple, easy-to-read units such as length of wedges in inches, or depth of a standard diameter hole, etc. Delivery is prompt. May we send you full details?

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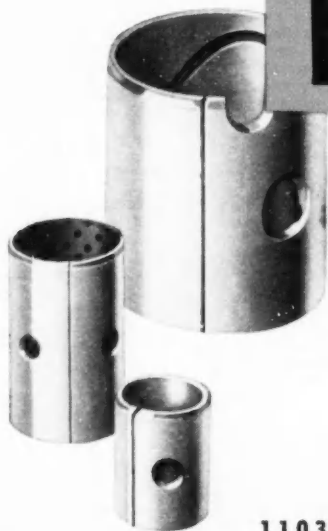


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Shorter cycles — most production for oven size. May be ceiling mounted.

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Fastest means of heat transfer. No warm-up required — no shut-off lag. Heat levels instantly changeable.

UNIFORM HEAT DISTRIBUTION

Evenray reflector oven walls give wide angle, uniform heat distribution on product.

LOWEST MAINTENANCE COST

Clean operating — no combustion by-products. Lowest source replacement cost.

COMFORTABLE WORKING CONDITIONS

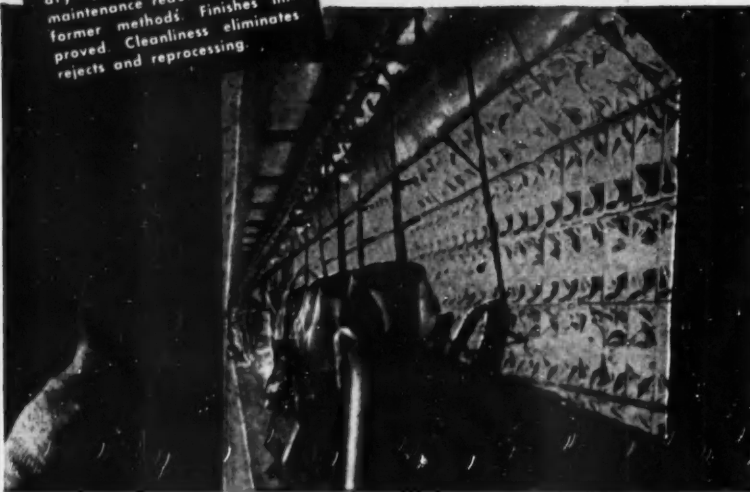
No room ventilation problems.

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Comparable to any quality-built oven.

One of 7 Fostoria ovens at Studebaker, Canada, for finish drying. Time reduced 50%, maintenance reduced 75% over former methods. Finishes improved. Cleanliness eliminates rejects and reprocessing.

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21,500 lb), and will be optional in the R-175 Roadliner, which has a GCW of 35,000 lb.

New features of International's three Super Red Diamond engines, built in 372, 406 and 450-cu in. displacement sizes that develop 143, 154 and 162 hp, respectively, include improved carburetion, enlarged stream-lined valve ports, and choice of gasoline or LPG fuel system. The improved 100-hp Super Blue Diamond 269 engine, with 6.5 to 1 compression ratio, develops higher net horsepower. Gasoline or LPG fuel systems are available.

New in two Silver Diamond engines, 220-cu in., 100 hp and 240-cu in., 108 hp sizes, are self-cleaning Slo-roto exhaust valves, durachrome valve seat inserts, visible-flow carburetion with fast-idle cam, ceramic-filter fuel pump, and wide-lobe camshaft. The Silver Diamond 240 is available with gasoline or LPG fuel system.

Diesel engines, in 135 and 150-hp ratings, are available for heavy-duty International trucks in the 21,000 to 35,000-lb GVW classification. Larger gasoline, LPG or Diesel engines power extra-heavy-duty trucks built at Emeryville. The standard power plant for these models is a 165-hp Diesel. Optional engines include Diesels rated at 175, 185, 200, 215, 275, 280 or 300 hp; gasoline engines that develop 267, 296 or 318 hp and LPG engines with 305, 335 or 356 hp.

BOOKS...

BASIC AERONAUTICS, by Merrill E. Tower, published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Price, \$3.70. This practical text contains the basic knowledge of aviation science and its Air Age industry. Written by a leading aviation educator, the book contains hundreds of photographs, illustrations and functional drawings. Part I of the 252-page volume deals with the airplane—why it can fly, how it is controlled, its parts, its engines and how they operate; operation and types of jet and rocket engines, helicopters. Part II describes the pilot's responsibilities, physiological effects of flight, air laws. Part III covers the medium through which the airplane flies—the air. Included in this discussion are clouds, winds, temperatures, air masses, etc., and how to interpret the various phenomena and to make weather forecasts. Part IV is on one of the most important phases of aircraft flight—that of navigating a plane from one place to another. Aeronautical maps and navigational methods are thoroughly explained. Part V covers airport usage, qualifications for the many jobs in the aviation industry, airline operation and the effect of national and international aviation on present and future life.

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Hungry Horse Dam
third highest in the world
reaching 564 feet skyward in Montana's mountains
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dependably serving the most brutal
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Biggest in the world are Boulder . . . Shasta . . . Hungry Horse . . . Grand Coulee . . . Ross . . . and other great American water-impounding structures.

Their demands for construction horsepower were stupendous.

And adequately met by the automotive industry's designing and manufacturing genius. In all kinds of motive power units used for these immense dam-building jobs, Spicer Universal Joints, Clutches and Transmissions helped to complete time schedules that were hungry for horsepower.

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BOOKS...

ADDITIVES, published by Petroleum Educational Institute, 9020 Melrose Ave., Los Angeles 46, Calif. Price, \$1.50. This pocket-size booklet describes new and late developments in the field of additives used in industrial and automotive oils and greases. It offers an elementary explanation of: the problems which are solved or relieved by use of present day additives; the action of present day additives which attacks the problem to be solved; how the action of present day additives serves to attack the problem; the several test engines used to evaluate the merits of present day additives. Procedure of the "L" series and other tests used to evaluate additive type oils. The API service classification and designations for automotive-type engine oils. It contains 80 pages and 110 illustrations.

ADVANCED MECHANICS OF MATERIALS, by Fred B. Seely and James O. Smith, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$5.50. For twenty years a standard work in its field, this book is now available in an entirely rewritten second edition. The volume again supplies a comprehensive view of the fundamental concepts and methods used in the analysis of stresses in structural and machine members. Designed for all engineers interested in the strength of materials, it emphasizes the relationships between design, stress formulas, failure of materials, and failure of machine or structural parts. Two new sections cover the influence of small inelastic strains on the load-carrying capacity of members, instability, and buckling loads. Other thoroughly up-to-date discussions include preliminary considerations of stress and strain, special topics on the strength and stiffness of members subjected to static loads, localized stress-strain concentration, and energy methods.

STANDARD METAL DIRECTORY, published by Atlas Publishing Co., Inc., 425 West 25th St., New York, N. Y. Price, \$15. The 1952 edition of this directory, the thirteenth in a series, has been enlarged and completely revised. It is divided into four sections: iron and steel plants; ferrous and non-ferrous metal foundries; metal rolling mills and smelters of non-ferrous metals. It contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and non-ferrous metal plants located in the U. S. and Canada. The plants are listed geographically and alphabetically. The reports give the name of the company, its capitalization, plant equipment, products manufactured, primary and secondary raw materials consumed, names of company officials, purchasing agent and sales manager. In addition, the directory contains special lists of: distributors of pig iron, ores, ferro-alloys and new metals; coke ovens in the United States; fabricators and distributors of iron and steel products; metal stamping plants; forging manufacturers; manufacturers of die castings; metal powder producers and sellers; smelters and refiners of primary and secondary non-ferrous metals; storage battery manufacturers; galvanizing plants; aircraft manufacturers; automotive vehicle manufacturers; dealers in used pipe and rails; scrap iron and scrap metal dealers; importers and exporters of ferrous and non-ferrous metals and metal products; dealers in used structural steel; operators of hydraulic presses; railway purchasing agents and manufacturers of equipment and supplies.

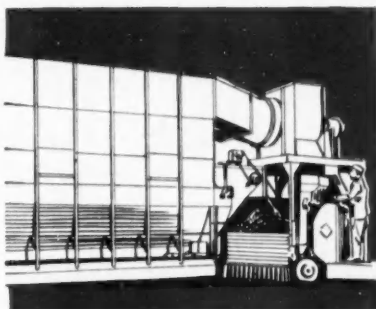


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Available in capacities to handle air cleaning jobs—large or small—singly or in batteries.



30,000 CFM errestor—in a large grey iron foundry removes dirt and dust from shake-out stations, sand handling and conditioning system.

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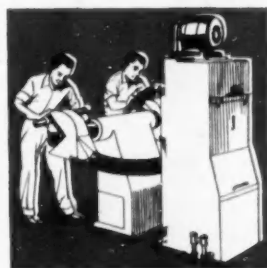
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Job Evaluation in Automobile and Aviation Plants

(Continued from page 53)

tive parts manufacturing industry was to assign the responsibility for installation to company employees alone. Over 58 per cent reported this assignment as compared with 10 per cent in the automobile field. The next most popular procedure was to assign company employees the responsibility but provide a consulting firm to help and advise when problems arose.

The use of the consultant alone was reported by only one firm. The three reasons cited most frequently by the automobile companies for having company employees and management consultants work together to install the program were: (1) provided technical skill in job evaluation practices as well as a knowledge of the organization, (2) required less time

for installation, and (3) permitted employee participation but made possible the maintenance of an objective point of view. Five major reasons for choosing company employees alone to install the plans were reported in the automotive parts industry. These were: they knew the organization better than outsiders; were well-qualified to install the program; aided in gaining acceptance and understanding of the plan; reduced suspicion toward the plan, and trained a group for maintenance of the program. The majority of the companies in both industries assigned those responsible for installing the job evaluation programs to the personnel department.

The over-all direction and coordination of the programs have been concentrated in the hands of one individual in the majority of the companies in both fields. Although individual control has been preferred to committee control, the title or position held by the director varies widely. The director of the program usually had the responsibility for establishing the installation procedures, selecting the personnel to carry them out, and maintaining and administering the job evaluation program once it is installed.

The six major functions of the jobs in both automobile and automotive parts companies which were rated with the greatest frequency were: Responsibility, knowledge, effort and skill, physical conditions, personal and social conditions, and supervision. Some companies employed a number of sub-factors under the major factors listed above while others did not break the factors down. The number of factors used in the automobile field ranged from five to 15 except for one company which used 23. The range was from two to 27 factors in the automotive parts field; however, the majority used from five to 15 factors here, also. A slight concentration was found for 11 and 12 factors. The major factors with the subfactors used in these industries are shown in Tables 1 and 2.

The more typical procedure in both industries has been to rate jobs up to, but not through, the department-head level. Sixty per cent of the automobile and slightly over 61 per cent of the automotive parts companies reported this practice. The administrator or the administrative

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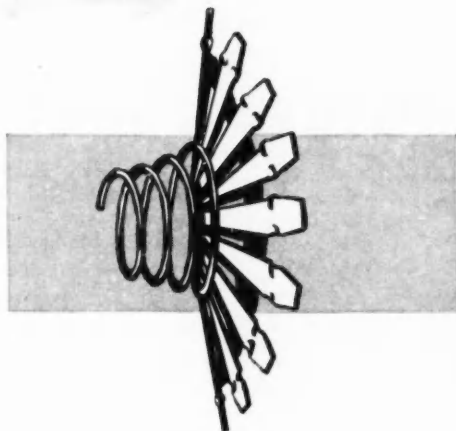
 <small>TRUCK</small>	 <small>BUS</small>	 <small>DIESEL</small>	 <small>OFF-HIGHWAY</small>
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Job Evaluation

(Continued from page 104)

group in charge of the over-all direction of the installation has been responsible for determining the range of jobs to include in the job evaluation program in the majority of the companies in both industries.

Most of the automobile manufacturing companies used more than one procedure for collecting information about job duties. No one particular method predominated but the more popular procedures were: interviewing the supervisor of the job; interviewing the supervisor as well as having him complete a questionnaire; interviewing the employee on the job; interviewing the employee as well as having him complete a questionnaire. A more definite pattern was found in the automotive parts field. Thirty-eight of the 54 companies interviewed the supervisor on the job while 28 interviewed the employee; some interviewed both. The third method in popularity was to have the job descriptions written by the department head, while having questionnaires about the job completed by supervisors or employees, or both, ranked next. Although the individual responsible for securing job information was often called a job analyst in both industries, the title for this position varied rather widely. This appears to be due to the fact that the person making the job analysis also performed other duties and the title used in such cases was more descriptive than job analyst would have been. Final job descriptions in both fields were usually prepared by the same individuals who secured the job facts. These final job descriptions were approved only by supervisors in most of the automobile and automotive parts companies, although it is recommended practice to have employees participate in this step.

Several methods were used in both industries to train employees in analyzing jobs. The four most popular ones in both the automobile and automotive parts companies were: studying job evaluation literature; learning procedures for getting job facts; preparing sample job descriptions which were criticized; and learning principles of interviewing.

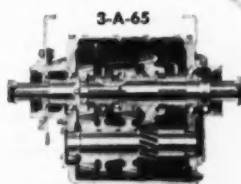
Both the automobile and automotive parts manufacturing companies were equally divided on assigning the responsibility for rating jobs to a committee and to one individual. The consultant, job analyst, personnel director (Turn to page 110, please)



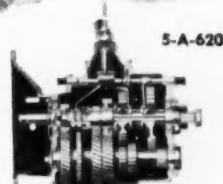
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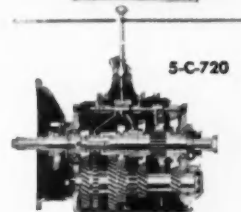
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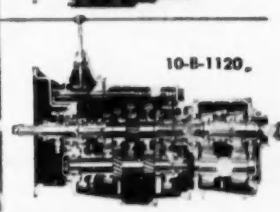
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5-A-620



5-C-720



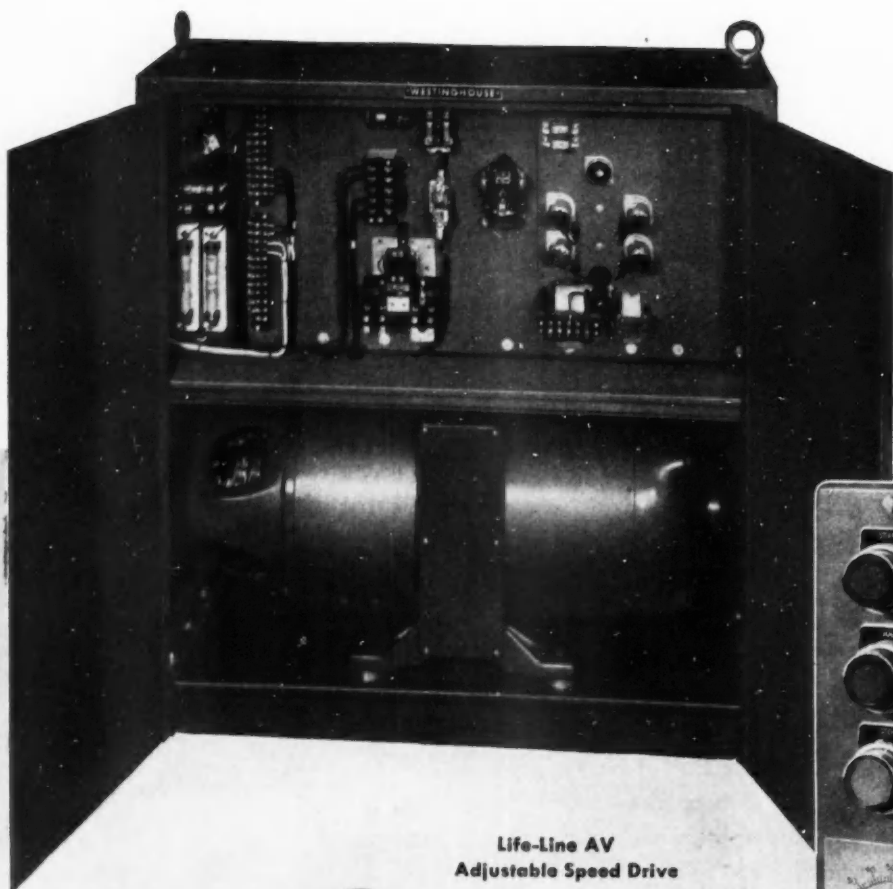
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Job Evaluation

(Continued from page 106)

rector, head of industrial engineering, personnel assistant, and controller were among the positions frequently named in both fields as either being solely responsible for rating or serving on a rating committee.

The personnel manager, the consultant, and the job analyst were generally responsible for conducting the training program for job raters in each industry. The four most

popular methods for training raters in both automobile and automotive parts companies were; studied rating system chosen; learned procedures for rating; rated sample job descriptions which were criticized; and studied job evaluation literature.

After the jobs were rated, the majority of the firms in both fields grouped them into classes. A wide range of classes was used in the automobile field with no one trend apparent. However, seven of the ten organizations reported 29 or fewer classes. The automotive parts manufacturing companies, in the majority

of instances, reported 19 or fewer classes. The person or group responsible for directing the job evaluation installation has made the decision most frequently in regard to the number of job classes to use.

The length of time required for completing the installations varied among the companies, but less than one year appeared to be more common for both industries. From one to two years was the next most typical period.

Insuring Company Acceptance

After the proposed job evaluation plans were completed, those individuals responsible for their development met with members of top management to explain the details of the program and to secure final authorization for adoption by the company. In addition to the meetings, members of top management had participated in the installation in several of the firms in both industries, and, thus, were already acquainted with the accuracy and validity of the plan. Individual interviews with members of top management were relatively popular in both areas as were memoranda or letters from the president to other members of management. Issuing descriptive literature about the program was utilized to a greater degree in the automotive parts field than in the automobile, but both used this method to some degree.

The three most popular methods utilized in the automobile manufacturing field for securing supervisors' acceptance of the program were individual interviews with supervisors, participation of supervisors in establishing the program, and meetings with supervisors to explain the plan. In the automotive parts manufacturing field, two methods were followed by the majority of the companies; namely, meetings with supervisors and participation of supervisors in establishing the plan. The issuance of descriptive literature about the plan as well as holding individual interviews with members of the supervisory group were also relatively popular procedures.

Various media for disseminating information to employees were used in these companies. Several procedures were followed with about the same degree of frequency in the automobile industry; namely, individual interviews with employees, memorandum or letter from the president, group meetings, and stories in the employee publications. A little clearer pattern was noticeable for the automotive



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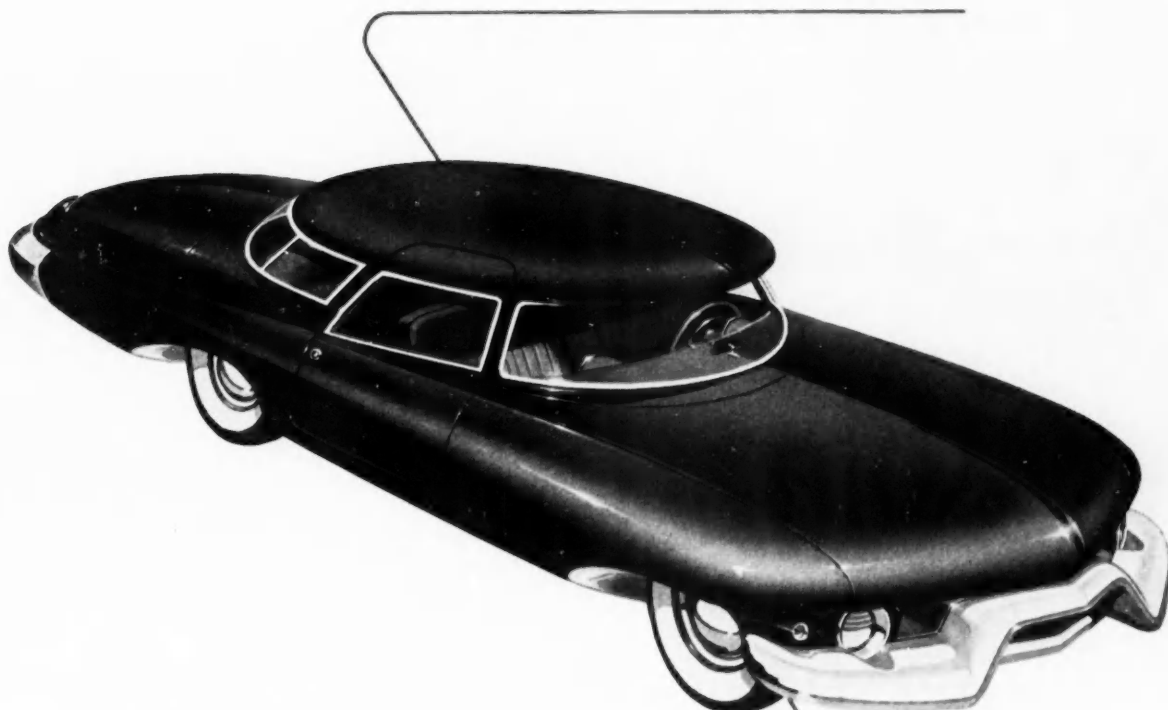
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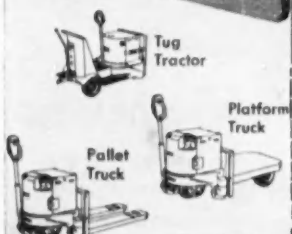
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parts field. Meetings with employees, participation in establishing the plan, and individual interviews with employees to explain the plan were the three methods used the greatest number of times.

All of the automobile companies expressed satisfaction with the plans, although the degree of satisfaction varied to some extent. One-half of the firms stated their plans were satisfactory. Forty per cent indicated highly satisfactory, while only 10 per cent modified the term with fairly. A similar pattern was found in the automotive parts field although the percentages vary slightly. Satisfactory was the most common term used, followed by highly satisfactory, then by fairly satisfactory. However, one of the organizations stated that while its plan for factory jobs had been satisfactory, the plan for office jobs had been definitely unsatisfactory.

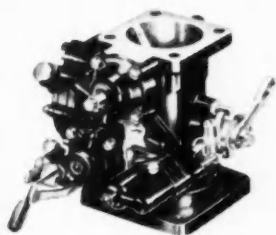
Automobile companies reported 12 different advantages resulting from the adoption of job evaluation and 13 were reported by the automotive parts companies. See Tables 3 and 4.

Maintaining and Controlling The Program

Both the automobile and automotive parts manufacturing companies have recognized the need for maintaining up-to-date programs. Practically all the organizations report that one or more methods have been established to perform this important step. Five procedures, listed in order of importance, were used rather consistently in the automobile firms. These were: records corrected immediately when change occurs; periodic wage surveys conducted; supervisors report job changes to job evaluation division; supervisors report new jobs to job evaluation division; and permanent job evaluation organization maintained for rating jobs. The six major procedures followed in the automotive parts manufacturing field were: supervisors report job changes to job evaluation division; supervisors report new jobs to job evaluation division; periodic wage surveys conducted; permanent job evaluation organization maintained for rating jobs; records corrected immediately to show changes; and periodic re-evaluation made of all jobs. Centralized control of the plan is maintained in all of the automobile companies and is centered in the personnel or industrial relations department in the majority of cases. Although

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19 of the automotive parts companies did not reply to the question, the remaining ones stated that responsibility for control had been assigned. The personnel or industrial relations areas were mentioned most frequently with industrial engineering playing a prominent part also. Some degree of variation exists in the areas of control but the more important ones named in both industries were: routing all recommendations for salary increases through the centralized unit in order to check for conformance with the plan; conducting

research in the field of job evaluation in order to keep abreast of the trends; conducting periodic wage surveys for the purpose of checking company rates against the going rates for the area, observing the day-to-day functioning of the plan in order to ascertain its weaknesses; recommending improvements in the plan; and keeping interest alive in the program.

All the companies in both fields which answered the question about operating difficulties had encountered one or more. The three reported with the greatest frequency were getting

changes in jobs and new jobs reported promptly, insuring uniform interpretation of the plan, and receiving pressure to increase individual rates above the maximum of the job.

Conclusions

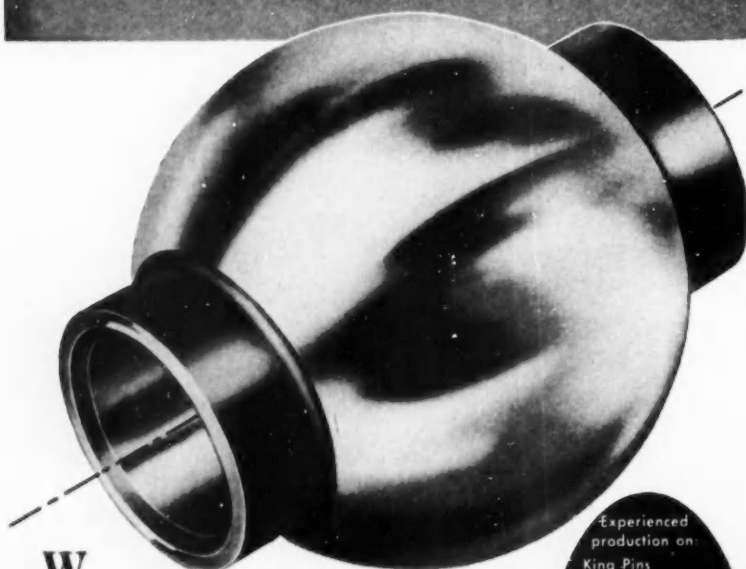
The automobile manufacturing and automotive parts manufacturing industries like other industrial and non-industrial organizations have found job evaluation to be a tool that can be used effectively in the solution, or at least in the adjustment, of problems arising from inequities in wages. It is no substitute for collective bargaining in organizations where union-management relations exist, but it does tend to minimize points of friction when accepted by both sides in good faith.

None of these organizations appear to believe or claim that all of the problems involved in their salary structures or in the paying of employees have been completely resolved. They seem to recognize that job evaluation is not a panacea for all ills and that the program is not such an exact science that all errors can be corrected. The factor of human judgment is involved to the extent that certain inequities are sure to occur. However, because the system provides an orderly and systematic approach in determining the relative worth of jobs, the consensus of the group appears to be that they have reduced or minimized the errors. Therefore, the conclusion can be drawn that in the automobile and automotive parts industries, as represented by this group of firms, job evaluation is worthwhile and that the programs will continue to operate in the foreseeable future.

BOOKS...

STANDARDS FOR TRAINING MACHINE TOOL DRAFTSMEN, published by National Machine Tool Builders' Association, 10525 Carnegie Ave., Cleveland, Ohio. Price, \$1.50. Prepared by the NMTBA Committee on Apprentice Training, this report is presented as a supplement to the Association's report on "Apprentice Training Standards for Machinists," issued by the Association in 1949. It includes a summary of standards for training machine tool draftsmen, and suggested forms of application for apprenticeship, apprenticeship agreement, conditions of apprenticeship, and quarterly apprentice report. It also contains a facsimile of a certificate issued upon completion of an accredited apprenticeship.

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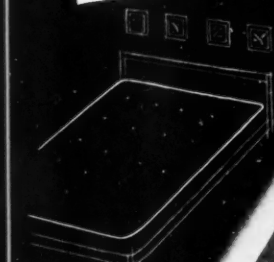
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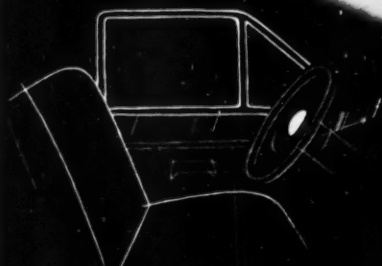
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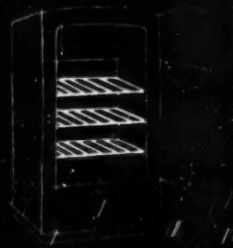


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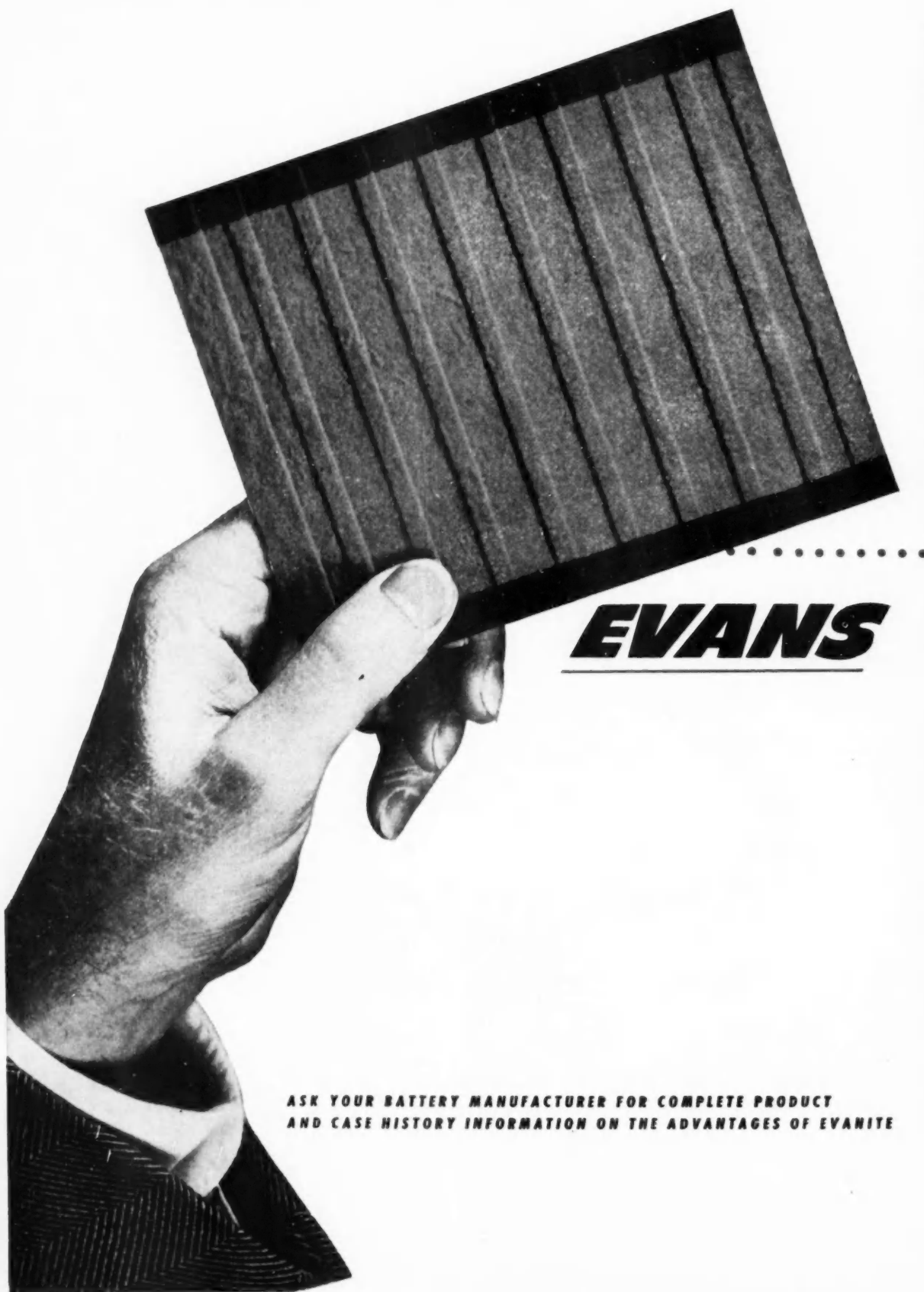


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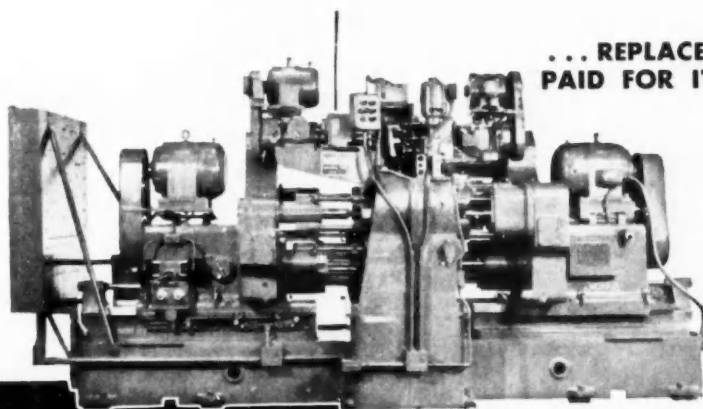
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BOOKS...

GOALS OF ECONOMIC LIFE, edited by Dudley A. Ward, published by Harper & Bros., 51 East 33rd St., New York, N. Y. Price, \$4.00. This book is the introductory study of a projected series of six books to deal with the problem of ethical responsibilities in American life. The purpose of the series is to define how ethical standards apply to the realities of earning a living and keeping the national economy stable and progressive. Several possible economic goals of our society are described and evaluated by a number of prominent economists. These and other social goals are then analyzed from the point of view of biology, anthropology, psychology, political science, law, history, philosophy, and theology. Criteria are thus established by which the specific economic activities discussed in the volumes to follow in this series may be evaluated. The 470-page book, drawing upon the thought and experience of social scientists and theologians, opens a major attack on the question of whether our economic system is consistent with Christian principles, or can be made so.

POWER PLANTS FOR AIRCRAFT, by Joseph Liston, published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price, \$8.50. A textbook for the undergraduate student in aeronautical and mechanical engineering, this volume gives the reader a concise, technical insight into the basic principles and comparative merit of all types of aircraft power plants. Included in the presentation are accurate and comprehensive comparisons of the many types of jet and reciprocating power plants, a fundamental analysis of the theoretical power-plant cycles, a comparison of actual engine performance with the theoretical cycles, and a discussion of some of the practical problems encountered in operation and testing. Nearly all new advances in the field that have been declassified are discussed fully. Within the limits of government restrictions, the book considers the basic principles of reciprocating engines, turboprops, turbojets, ramjets, rockets, and potential nuclear types. A unique approach, arrangement, and treatment keynote this volume. Illustrations are an integral part of the text, following the new theory of visual education. This approach facilitates the rate and ease of learning. The book includes a profusion of diagrams, charts, examples, review questions, and problems designed to aid the student in a clearer and more rapid understanding of the basic principles.

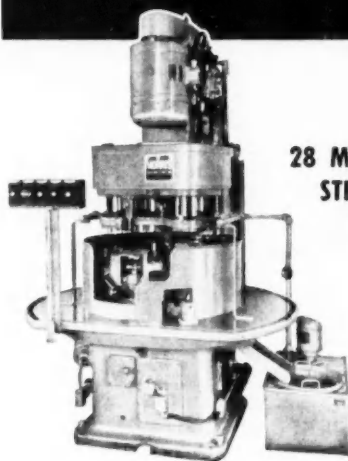
AUTOMOTIVE ANTIFREEZES, published by National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C. (Order from Government Printing Office, Washington 25, D. C.) Price, \$0.15. This circular (No. 506) is intended primarily for the average automobile owner, but it should also prove helpful to manufacturers and businessmen interested in the field of antifreeze production. It discusses such questions as when antifreeze should be installed, what strength should be used, and what kind of antifreeze is best suited to the service involved. In addition, it gives information concerning pertinent physical properties and service performance of the major categories of antifreezes. The publication summarizes the results of extensive tests at the Bureau as well as the work of other investigators.



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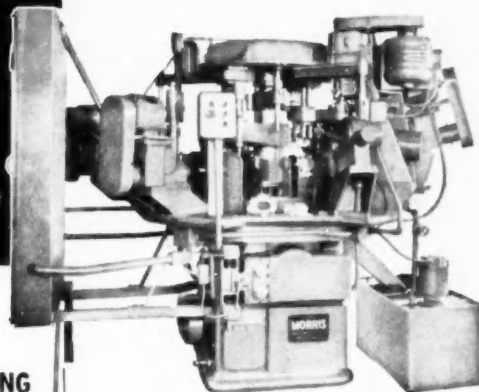
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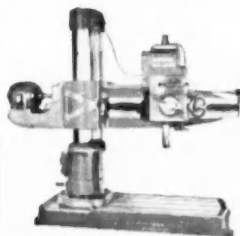
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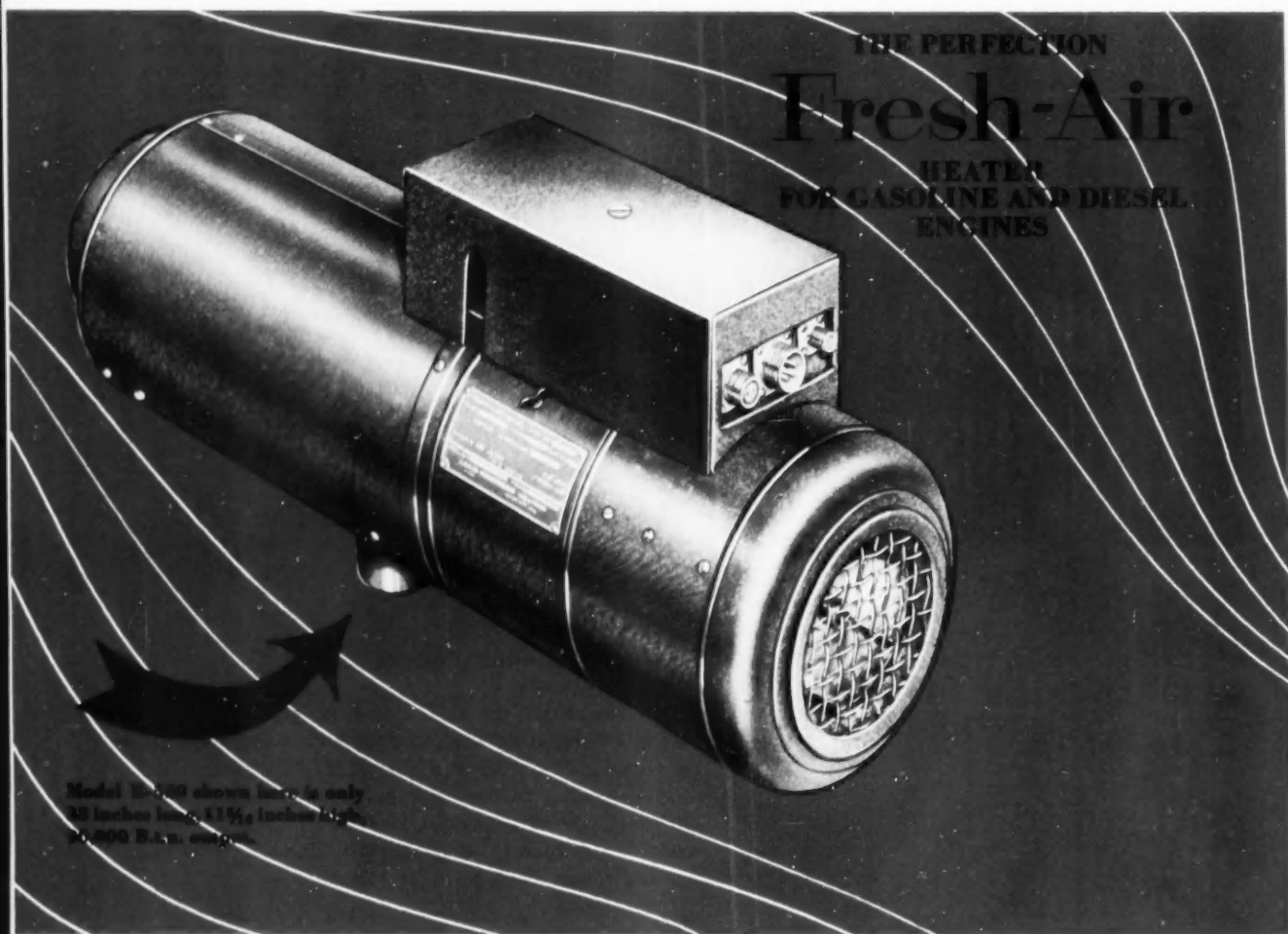
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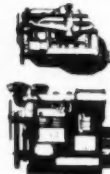
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Keeps Windshields Clear — Always! Guarantees proper vision by quickly disposing of ice, snow and fogging.



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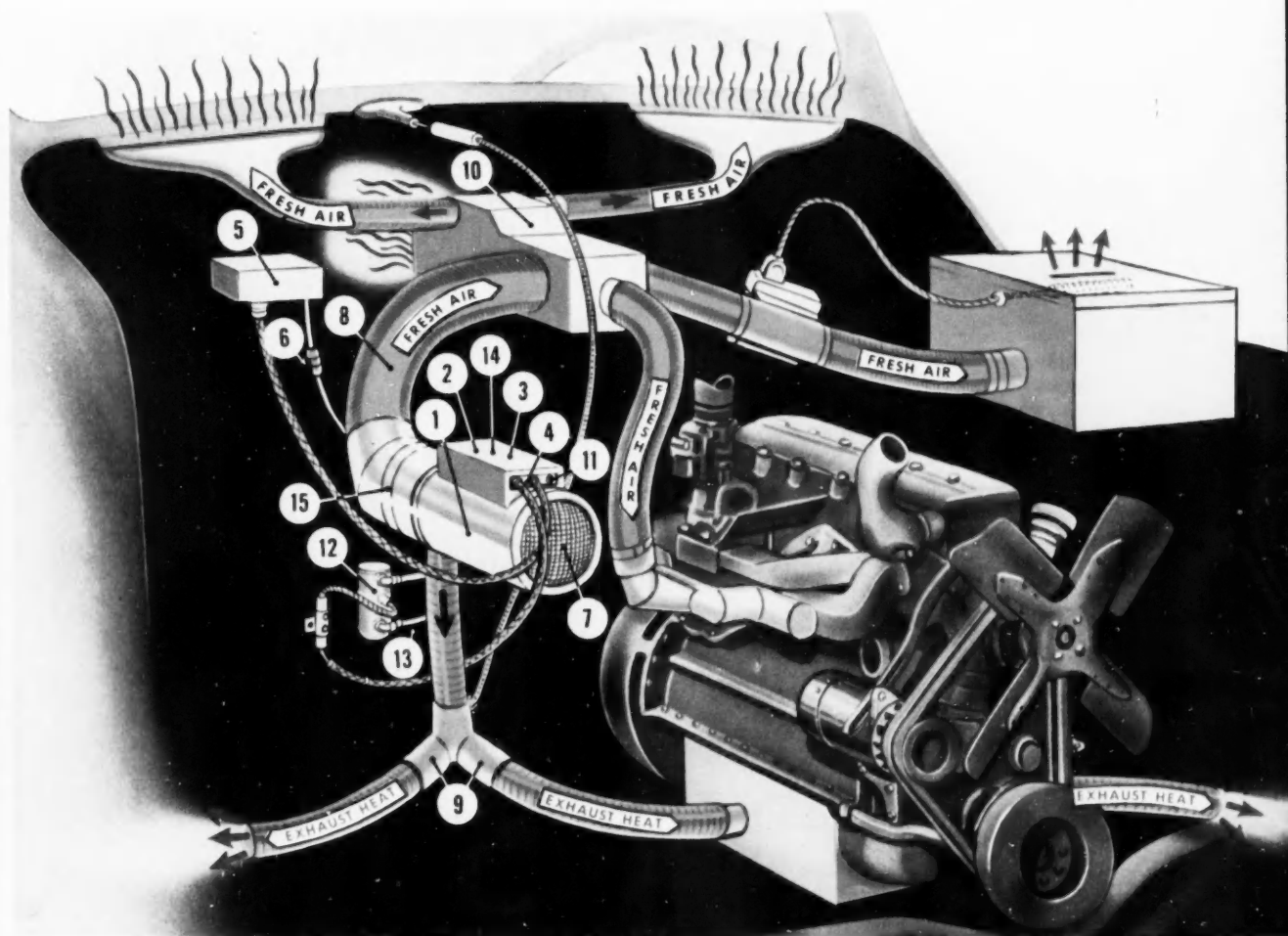


Preheats Gasoline and Diesel Engines! Assures quick, easy starting. Prolongs engine life. Eliminates costly "freeze-ups".

PERFECTION STOVE CO. • 7392-A PLATT AVE. • CLEVELAND 4, OHIO

Perfection

Four popular sizes tailor-made by Perfection for your job!



1. Compact Tubular Heater Design—EXTRA strength, LONGER life and HIGHER efficiency because of tubular design and finned heat exchanger.

2. Easiest to install and service—Blower, burner, heat exchanger and ALL safety controls built into ONE unit. Compact! 20,000 B.T.U. size weighs only 20 lbs.; 30,000 B.T.U. size—23 lbs.; 60,000 B.T.U. size—28 lbs.; 90,000 B.T.U. size—36 lbs. Can be mounted in ANY position. Operates independently of vehicle engine.

3. Non-Clog Fuel-Metering Jet—This Perfection EXCLUSIVE maintains a steady flow of fuel regardless of temperature changes.

4. Positive Electric Starting—Dependable

Perfection Glow Plug provides positive ignition. Perfection Fuel Timer shuts off fuel supply, eliminates flooding in case of fuel or battery failure.

5. Remote Control—ONE switch, mounted where you want it. Manual, semi-automatic or fully-automatic operation.

6. ONE connection ONLY to Power Source.

7. Exclusive Blower Design—Unique blower delivers more heat through longer duct lengths without the aid of an additional fan.

8. Maximum Heat—Tubular design, dual heat-exchanging chamber, finned construction deliver maximum heat with minimum power and space requirements.

9. Extra Heat When Needed—Additional heat for heating oil pan, transmission or batteries available from the heater's exhaust.

10. High Pressure Distribution—Positive delivery of fresh, heated air to all points from a single heater.

11. Thermostat Connection—Provides for semi-automatic or fully-automatic operation.

12. Fuel Pump—This pump means heater operates entirely independently of vehicle engine.

13. Single Connection to Existing Fuel Supply Tank.

14. Quality Built-in Fuel Filter.

15. Quality Construction Throughout.

MEETS ALL THE LATEST MILITARY SPECIFICATIONS—TESTED TO 90° BELOW ZERO OPERATION

End your cold war **NOW**—with the Biggest Little Heating Package in the World

PERFECTION STOVE CO. • 7392-A PLATT AVE. • CLEVELAND 4, OHIO

Fresh-Air Heaters

SELF-LOCKING "PLACE" BOLTS

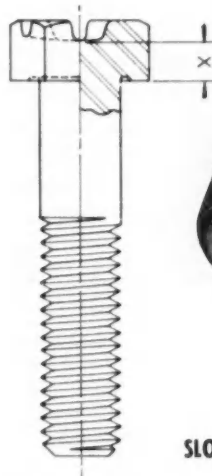
...cut costs...add strength

... wherever involuntary loosening or fatigue are a problem!

In some typical automotive and farm equipment applications, for instance, "Place" Bolts are being used as connecting rod bolts, main bearing cap screws, and flywheel bolts.

Here, and wherever a locking bolt may be needed, the Slotted-Type "Place" Bolt offers not only positive locking action but economy and additional strength. It cuts costs because no additional parts or operations are needed. It adds strength because its controlled spring action guards against impact, shock and fatigue failures.

National makes the Slotted-Type "Place" Bolt in carbon or alloy steel, in any of a wide range of sizes. Write us for additional information, including our illustrated folder.



**HERE'S HOW
SLOTTED-TYPE HEAD LOCKS**

The flexible diaphragm formed between slotted segments in the upper face of bolt head and circular recess adjacent to the shank in lower face (section X) acts as controlled spring element when head is properly wrenched against a rigid seat. Diaphragm is reinforced by the continuous-grained segment cold formed between upset slots in upper face.

U. S. Patent No. 2543705



THE NATIONAL SCREW & MFG. COMPANY

Cleveland 4, Ohio

Pacific Coast: National Screw & Mfg. Co. of Cal.

3423 South Garfield Ave., Los Angeles 23, Cal.



FASTENERS



HOELL CHAINS



CHESTER HOISTS



AIRBRIEFS

(Continued from page 72)

to produce a missile today in quantity for the job of which it is capable, we would have to produce the V-2. What I am afraid of is that if we want to build a missile in quantity five years from now, we would have to resurrect the V-2!"

Molded Magnesium

The aircraft industry has found that magnesium sheet, intended for forming, must not be heated to more than 300 F, nor held at this temperature for more than 15 min if its material properties are not to be adversely affected. This time limit had made stretching a serious problem and use of the drop hammer virtually impossible. Stanley Pelton, Chance Vought engineer, has come up with an interesting solution to the problem: the use of low-pressure laminate procedures. Chance Vought places the magnesium sheet on a laminated glass fibre mold. The sheet is covered with a canvas bleeder material and this is covered with a Neoprene blanket taped to the mold. Air is evacuated between the mold and the blanket and the assembly placed in a regular autoclave. After 20-75 min in the autoclave at a pressure of 50-90 psi and a temperature of 250-270F, the assembly is removed after having been neatly formed without any change in its material properties. The magnesium sheet can also be bonded simultaneously with its forming, due to the presence of heat and pressure in the autoclave.

Licking the Stall

The stall, a condition in which an airplane wing ceases to provide lift because the airflow around it is literally "stalled," has accounted for about 90 per cent of aircraft accidents in aviation history. For the past 20 years the stall problem has been handled by: (1) making the airplane stall-resistant through design, (2) providing a stall warning indicator in the cockpit, (3) placing great emphasis on the dangers of the stall in training and operation. Now a fourth and surprising solution is being investigated: automatic equipment to permit an airplane to land safely in a fully-stalled maneuver. Cornell Aeronautical Laboratory has developed a special servo system which enables the pilot to control the airplane in the stall and permits the airplane to descend from altitudes to a safe landing while stalled throughout. The re-

sulting landing greatly reduces the landing roll and anticipates a solution to the jet aircraft problem of slowing the fast, clean airplanes down for a landing and braking to a stop. Cornell believes that fully-automatic equipment can be developed to make the stall a safe, useful maneuver for an airplane, thereby ending the greatest menace in flight.

Martin Recovery

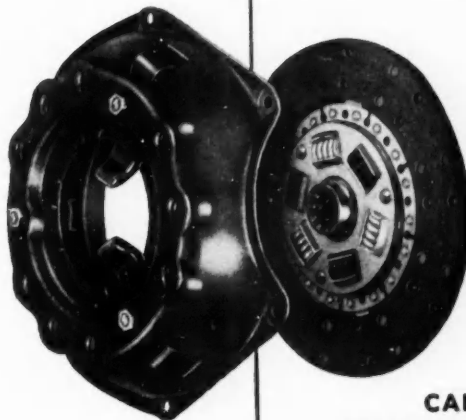
The Glenn L. Martin Co. has paid up in full its outstanding RFC loans well in advance and the company is now in a sound financial position for

the first time since 1947. The company, thus, has made one of the fastest comebacks in the aircraft industry in recent years. Martin had borrowed a total of \$47 million from the RFC since 1947, and had utilized \$35 million of it. It has now cancelled plans to take down the remaining \$12 million in credits. The recovery came in the past year under the direction of George F. Bunker, formerly of the Pullman Co., who reorganized the company. Major share of the profits allocated to the loan payments, came from the Martin B-57A Canberra program for the Air Force, and the big

Engineered by

BORG & BECK®

means . . . CLUTCHES built to the exacting standards which have made the name BORG & BECK famous for 36 years!



Reg. U.S. Pat. Off.



YOU
CAN DEPEND ON
BORG & BECK®
CLUTCHES... FOR THAT VITAL
SPOT WHERE POWER TAKES
HOLD OF THE LOAD

BORG & BECK DIVISION
Borg-Warner Corporation
CHICAGO 38, ILLINOIS

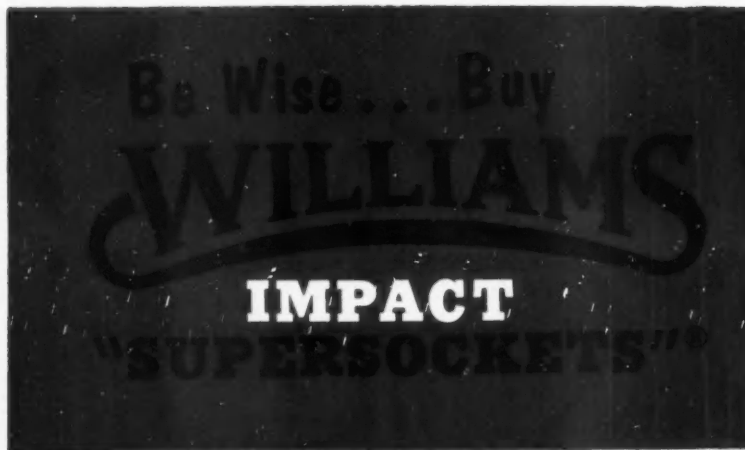


**7 square drive sizes
...over 300
sockets and
accessories
up to
20%
extra production**

Williams Impact "Supersockets"® are important to production-minded men because:

1. They are available in regular and bolt clearance lengths with hex and double square openings in 1/4, 3/8, 1/2, 5/8, 3/4, 1 and 1 1/2" square drive sizes plus innumerable shanks, extensions and special sockets.
2. They are adaptable to all socket locking methods used on the various makes of power wrenches and nut runners...can also be used with hand socket-drivers.
3. They are made of extra-tough, fully heat-treated alloy steel—specially designed and machined for extremely close fit to outlast ordinary sockets.

You can get IMPACT "Supersockets"® quickly through your Williams Industrial Distributor. Write us for Catalog A-100.



J. H. WILLIAMS & CO., 488 Vulcan Street, Buffalo 7, N. Y.
Known for Quality Drop-Forgings and Drop-Forged Tools

P5M-1 flying boat for the Navy, although the company has extensive contracts for development work in the missile and electronics field.

Largest Industry

Mundy I. Peale, Republic Aviation Corp. president, predicts that the aircraft manufacturing industry will become the largest employer of industrial workers in the nation this year. Peale predicts that 800,000 employees will be at work building airplanes by the end of the year and that these will be supported by 4 million employees producing aircraft components, equipment and parts.

BOOKS...

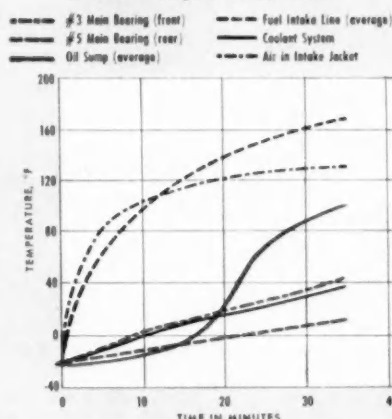
MINERALS—A KEY TO SOVIET POWER, by *Demitri B. Shimkin*, published by *Harvard University Press*, Cambridge, Mass. Price, \$8.00. This book, written by a consultant and contributor to *AUTOMOTIVE INDUSTRIES* on Russian industrial affairs (see "The Automobile Industry That's Behind the Iron Curtain," February 1 and 15, April 1, 1948), gives a systematic survey of the mineral resources, production, and consumption position of the U.S.S.R. It also attempts a new, more rigorous approach to Soviet economic problems and potentialities, thus providing an insight into Soviet policies. In the opening chapters, Dr. Shimkin outlines his aims and methods and analyzes at length the peculiarities and highly variable reliabilities of statistics on the Soviet mining industries. The bulk of the volume surveys thoroughly the major group of minerals: ferrous and nonferrous metals, gold, the fuels, and other nonmetallies. Within this framework, and as far as data are available, the discussion of each mineral reviews production, foreign trade, consumption, and utilization patterns, reserves, and deposit geology. The detailed treatment of mineral resources within the Soviet Union proper is supplemented by a brief review of satellite output and reserves. The volume covers the period 1926 through 1950. The author then summarizes the past and indicates the potential development of Russia's mineral position. Throughout the study American technological standards and practices are compared as a basis of reference.

BRAKE MAINTENANCE MANUAL, published by *Wagner Electric Corp.*, 6400 Plymouth Ave., St. Louis 14, Mo. Price, \$1.00. Covered in this book are the maintenance and repair of all modern hydraulic and mechanical brake types used as original equipment on passenger cars, trucks, buses, and trailers. The subject is completely and thoroughly covered from fundamentals to service tips. The volume is indexed three ways for ready reference: by subjects; by make and model; and by brake types. Step-by-step explanations and recommendations are accompanied by more than 200 self-explanatory illustrations. One feature of the 50-page book is a trouble check chart listing 14 common braking complaints with 62 causes and solutions.

NOW! *South Wind* HEATING SYSTEMS

combine all these benefits in one heater!

Temperature vs. Time
of Diesel Engine Components



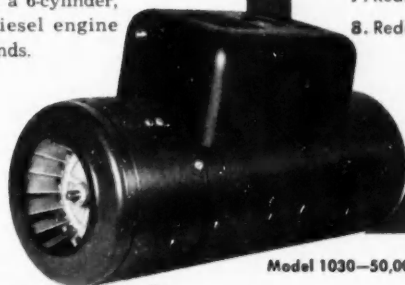
FIGURES THAT PROVE SOUTH WIND'S SUPERIORITY

Lab Tested . . . Field Tested . . .
Best by Every Test!

South Wind's entirely new principle of scientific pre-heating has been developed, tested and proved in the field, as well as in the Stewart-Warner Laboratory Cold Room.

Here is a typical temperature record of critical engine components during pre-heating (only minimum capacity 70,000 BTU/hr. pre-heater kit used). This heat provided adequate temperature rise for easy starting—with less than 5 seconds' cranking.

Data is based on a 6-cylinder, 2-cycle, 225 HP Diesel engine weighing 3,000 pounds.



Model 1030—50,000 BTU/hr. output.

South Wind

REG. U. S. PAT. OFF.

PERSONNEL HEATING
ENGINE AND
EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING



Engine Pre-Heating

Answers needs of all types of engines, all pre-heating requirements. Floods engine components, battery, crankcase, carburetor with warm, heated air. Makes starting easier, faster—even at 65° below!

Personnel Heating

Warm air—independent of engine heat, independent of engine operation—circulates swiftly, evenly, to keep personnel comfortable at all times.

Windshield Defrosting

Keeps windshield reliably "frost-free." Assures clear vision, safer driving.

Compact, powerful, dependable
Stewart-Warner "South Wind" pre-heating
systems are first choice of engineers and
maintenance men for these reasons:

1. Provides quick starting required by Military Services—even at 65° below.
2. One heater provides engine starting, cab heating and defrosting.
3. Provides only clean, dry hot air to engine.
4. Permits use of optimum viscosity lubricants.
5. Normal lubrication at all times.
6. Lowers engine maintenance cost—prolongs engine life.
7. Reduces battery drain by reducing starting torque.
8. Reduces cost of starting aids.
9. Eliminates shock loads imposed by brute force starting methods.
10. Inhibits sludge formation and freeze-up of engine accessories.

There's a South Wind Heater for
every Pre-Heating need

Do You Have A Heating Problem? Write today for the experienced counsel of South Wind field engineers about any problem in external or internal pre-heating. The wide range of South Wind Heaters includes 20,000–30,000–50,000–100,000–200,000 and 600,000 BTU/hr. capacities. Write South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

The Business Pulse

(Continued from page 74)

as noted above, some change in consumer buying habits appears to be developing. On December 15, non-agricultural employment totaled 48.8 million, a new record for the month and 1.2 million higher than in December, 1951. No data are available as yet on personal income in the final month of 1952; but estimates indicate that it was running at a seasonally adjusted annual rate of about \$278

billion, roughly \$15 billion higher than in the like month of 1951.

Wholesale trade also showed an improvement in the early part of the year, apparently influenced by the gain at the retail level. The market exhibits of household goods in New York and Chicago, for example, were attended by more buyers than at any time since the second wave of post-Korean "scare buying" in the early part of 1951. Sales volume was reportedly very good, with some manufacturers forced to close order books early to avoid overcommitments. Buyer attendance at apparel showings of

spring and summer lines has also been satisfactory so far this year, and the total dollar volume of orders appears to be running comfortably above that of a year ago. The most pronounced gains have reportedly occurred in orders placed for men's wear.

Deflationary Forces

On the price front, the balance of forces continues on the deflationary side. Basic commodity prices, which have been under almost continuous pressure for the past two years, show no signs of becoming stabilized as yet. Plentiful supplies of farm products still seem to be the basic element of weakness in the current market situation, but the prices of many industrial materials lack firmness as well. Despite the flurries in retail and wholesale trade mentioned above, prices of processed and manufactured products show no firm upward tendency. Indeed, there are some indications that the price softness in materials is beginning to carry over into manufactured products. In the past, this has been prevented by rising labor and transportation costs, among other things, with certain exceptions such as textile products, which have been declining since spring of 1951.

Developments pointing to the possibility of lower prices for manufactured products have occurred in several industries. There have been slight reductions, for example, in the list prices of some 1953 automobiles and in prices of certain accessories. In other instances, automobile manufacturers have offered improved 1953 models at no increase in prices. There have been a few cases of price reductions by manufacturers of consumer durables other than those in the automotive field, but for the time being, tendencies toward lower prices are mostly in evidence in distributor and retail markets. At these levels there appear to have been, for example, fairly substantial recent reductions in the prices of housewares, while in appliances it is reported that discounts and liberal trade-in allowances are being increasingly offered. Past experience would indicate that these pressures will be felt more and more at the manufacturer's level, suggesting the possibility of more generalized price reductions later in the year as supplies of basic materials become more abundant.

Declining Farm Income


The continuing weakness in prices of farm products has evoked expres-

(Turn to page 130, please)

JOHNSON *Tappets*


are made by Tappet Specialists

Thorough and complete attention by the entire Johnson Tappet organization to these important working parts of your engines assure you of maximum tappet life and performance.



SELF LOCKING TAPPET SCREW
Originated by Johnson this diaphragm type Self Locking Tappet Screw is operating successfully in millions of cast iron and steel tappets.

"Tappets Are Our Business"

JOHNSON  PRODUCTS
INC.
MUSKEGON, MICHIGAN

This continuous roll machine at the C-D-F, Bridgeport, Pa. plant makes top quality sheet fibre for electrical insulation. Corrosion-resistant rollers are made from laminated Dilecto, another famous C-D-F product.



DIAMOND VULCANIZED FIBRE

- mechanically and electrically strong
- moisture, arc and chemical resistant
- high dielectric strength
- easily machined and formed
- low-cost with long life

watched all the way... DIAMOND VULCANIZED FIBRE

Naturally it takes a big, well-equipped company like C-D-F to make fibre. It also requires a special brand of know-how and long experience to take rag paper (we make our own), zinc chloride and water and come up with a low-cost uniform product that can be adapted to a million uses.

Maybe you think that vulcanized fibre has been replaced by many newer, more publicized materials. Actually Diamond Vulcanized Fibre today has more applications, more unique qualities, more product design value than ever before.

If you need a dependable source for bone, commercial, Diamond "fish paper" insulation, tubes, rods, receptacles . . . talk to the man who knows . . . your C-D-F sales engineer (offices in all principal cities), or write C-D-F, Newark, Delaware.

THE NAME TO REMEMBER

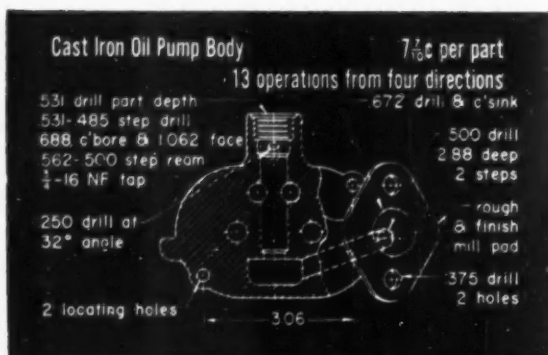


DIAMOND VULCANIZED FIBRE

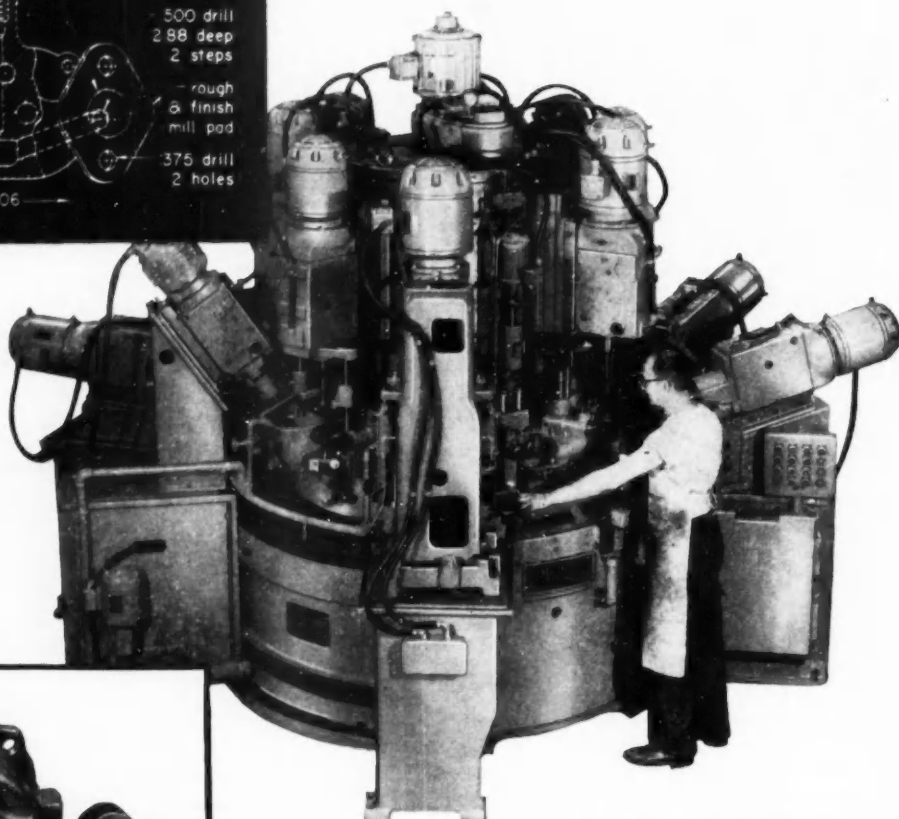
Continental-Diamond Fibre Company

NEWARK 2, DELAWARE

More parts per man-hour soon



**13 Operations
from 4 Directions
7 $\frac{7}{10}$ c per part**



**Production is 200 parts
per hour gross.**

KINGSBURY Special Purpose Drilling and Tapping Machine Combines Operations to Save Money

Dear Sir:

Look at this Cast Iron Oil Pump Body. How many machines would *you* need to do all this work? One central column Kingsbury with an 84-inch base and 60-inch index table does all 13 operations. It has ten stations with 11 drilling units and one tapping unit. One unit has a two-spindle auxiliary head. Six

units are mounted vertically. The other six units are mounted on knees bolted to the base and these are mounted at three different angles to the work.

The longest single operation governs the time required to finish one piece. By splitting a long operation into two short ones, using two units, the time cycle can be cut. Thus the .500 hole is drilled in two steps.

Bushing carriers guide all tools except the tap, the milling cutters and the second .500 drill. This means accurate alignment and precise positioning from the locating point. An interesting operation is the finish milling operation which has a special mechanism that draws the cutter away from the work on the up stroke. No tool marks to mar the finish.

pay for a KINGSBURY

Designed to Produce One Part

Kingsbury Machines are designed for low production costs on long runs of parts requiring several operations. The more operations at one setup, the greater are the savings possible. But these machines pay for themselves on simple work too. For example, the Steel Bearing Race shown at the lower left requires only a few operations. The Kingsbury machine soon paid for itself with more parts per man-hour at greater accuracy.

Each machine is equipped with $\frac{1}{2}$ to 5 hp automatic units. The number of units and the type of work holders depend on the work to be done. The work table may be stationary or it may be indexed. Your Kingsbury will come to you ready to run.

How Unit Costs were Figured

Each unit cost shown is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly rate}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

The unit cost of the machine:

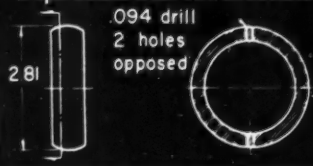
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

The costs include just the man and the machine — no power or overhead. As to the 6000 hours, that's about three years for one shift — one year for three shifts.

If you want more information just drop us a line.

Sincerely,
Kingsbury Machine Tool Corp.
99 Laurel St., Keene, N. H.

Steel Bearing Race $\frac{1}{10}$ ¢ per part
2 operations from two directions



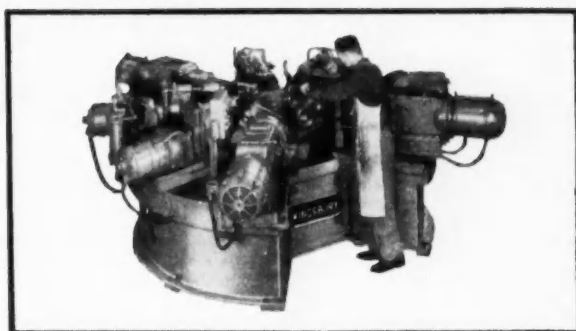
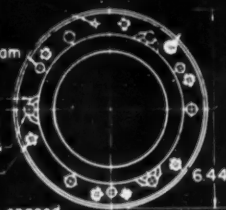
Steel Bearing Race

2 Operations—from 2 Directions $\frac{6}{10}$ ¢ per part

The machine on the left looks simple, doesn't it? It is, but it really produces. The operator of this double end machine puts in one piece and trips a lever. Air cylinders clamp the work and opposed units drill .094. While they are

Cast Iron Transmission Drum $2\frac{1}{2}$ ¢ per part
42 operations from one direction

177 drill, c'sink
no 12-24 NC tap
2 holes
358 drill, 375 ream
3 holes
bevel spot face
3 places
406 drill 6 holes
257 drill, c'sink
18-18 NC tap
6 holes equally spaced

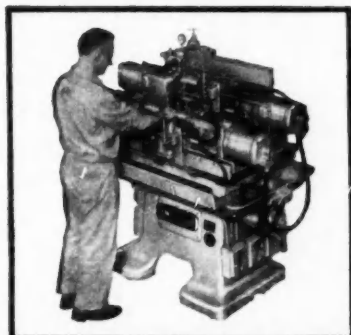


Production is 330 parts per hour gross.

Cast Iron Transmission Drum

42 Operations $2\frac{1}{2}$ ¢ per part

Note the number of operations. (42 spindles are required, all working at once.) This Kingsbury machine has a 100-inch base and 30-inch index table. There are seven drilling units and one tapping unit. All are mounted horizontally and use auxiliary heads with from three to nine spindles each. Bushing carriers guide all tools but the taps. Each fixture is automatically unclamped as it indexes to the unloading station.



Production is 680 parts per hour gross.

KINGSBURY

AUTOMATIC DRILLING
& TAPPING MACHINES
for Low-Cost High Production

MONEY-SAVING IDEAS

about spray finishing and coating

HEAVY MATERIALS

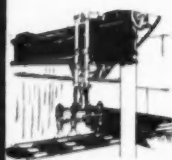


MATERIALS HANDLING
EQUIPMENT
9 models
of air-operated pumps

Save up to 15% in time

Pump or spray "heavy" materials—like sound deadeners, buffing compounds, rust preventatives, gear lubricants, etc.—directly from the original container by using a Binks Material Handling Pump. You save up to 15% in handling time alone.

AUTOMATIC FINISHING



AUTOMATIC
EQUIPMENT
lowers production costs
improves finish quality

Cut finishing costs automatically

On flat surfaces, use Binks Model 7R Spray Guns. Mechanical arms sweep the guns back and forth across products like wallboard, tile, glass, table tops, range parts, etc. On round or multi-sided products, use Binks Model 21 Guns for automatic finishing inside and/or outside. Ideal for such products as vehicle wheels, golf balls, appliances, etc.



PAINT CIRCULATING
SYSTEMS
same finishes
every time

PAINT CIRCULATING SYSTEMS

Get identical finishes at each station

Each spray station in the plant gets exactly the same paint at exactly the same pressure when you use a Binks Paint Circulating System. Paint circulates from a central mixing room, giving you rigid control of color and viscosity. The operator cannot change the material pressure. Identical finishes are a certain result.

AIR SUPPLY SYSTEMS



AIR SUPPLY
SYSTEMS
for filtered, heated air

Stop dirt marring your finishes

Bring air into your spray booth(s) through a Binks Air Supply System. This system takes in fresh air from the outside, filters, heats, delivers it...warm and dirt-free...to the right area in the correct volume.

Mail coupon
for informative, time-saving catalog!

Binks Manufacturing Co. 3120-30 Carroll Ave., West, Chicago 12, Ill.

Binks
EVERYTHING FOR
SPRAY PAINTING



Gentlemen: Please rush my FREE copy of your CATALOG-DATA BOOK No. 955 containing informative descriptions of the many money-saving products in Binks complete line.

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COMPANY _____
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CITY _____ ZONE _____ STATE _____

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES - SEE YOUR CLASSIFIED PHONE DIRECTORY

The Business Pulse

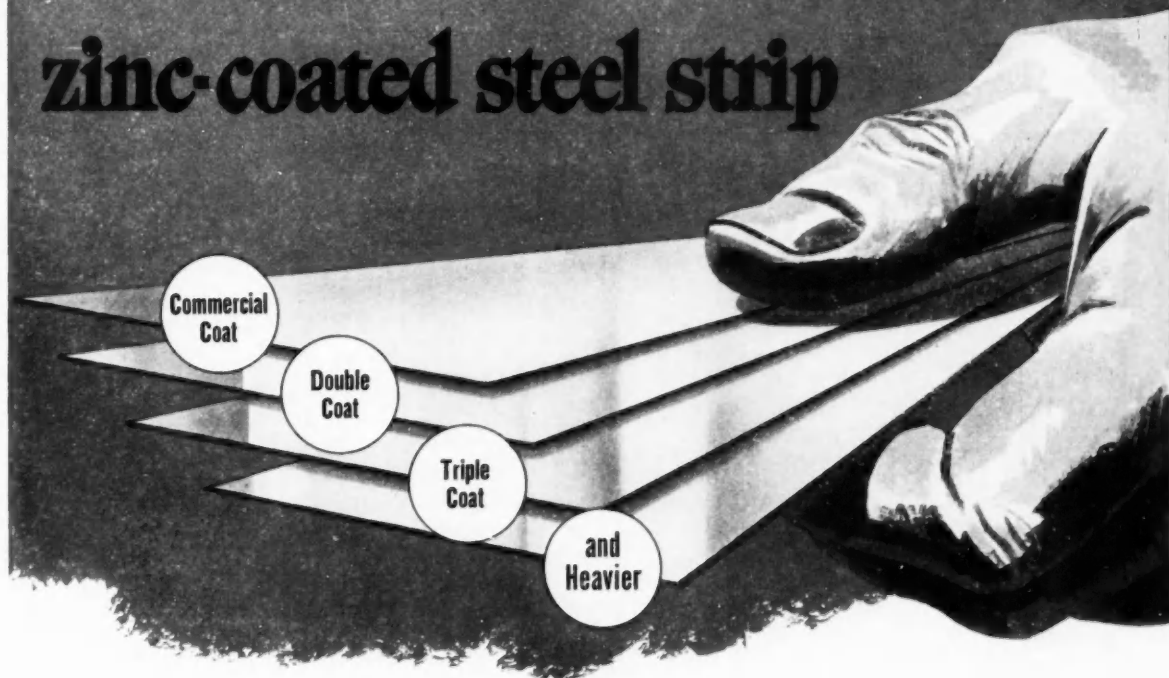
(Continued from page 126)

sions of concern by members of the farm bloc in Congress. The general level of farm prices has dropped some 15 per cent from the post-Korean high reached in February, 1951, and there is no indication as yet that the decline has been checked. Since there has been no decrease of corresponding extent in prices of goods and services used by farmers in production and consumption, farm income and purchasing power have declined. As a result, criticism has been directed at the present farm program, and various Congressmen have offered proposals for extending protection to the farm sector of the economy. Most of the suggestions offered so far have been aimed exclusively at bolstering prices, rather than at the fundamental supply-demand relationships which underlie the downward pressure. Again, as in previous cases, it is being pointed out that arbitrary price-fixing devices tend to compound rather than solve the basic problem, inasmuch as their natural effect is to stimulate, not reduce, farm output. The Senate Agricultural Committee has announced that its major task in the present session of Congress will be to study the causes now operating to lower prices. So it appears that these controversial issues will be given full airing.

BOOKS...

COMPRESSED AIR POWER IN INDUSTRIAL PRODUCTION, published by Compressed Air and Gas Institute, 1410 Terminal Tower, Cleveland, Ohio. Price, \$0.25. This 36-page pamphlet, which contains 63 illustrations including photographs and line drawings, is the third in a series of engineering studies in the CAGI education program. It is directed to designers, engineers, and production men in industrial plants. The booklet discusses pneumatic tools and aids to production, so that these men may be better able to evaluate the usefulness of pneumatic equipment. In so doing, they will be in better position to design and/or install production equipment which will result in the most economical operations utilizing compressed air power. The pamphlet presents concisely, but comprehensively, the many uses of compressed air in industrial production: actuation by air cylinders, agitation of liquids, blast cleaning, chipping and scaling, clamping, drilling, forging, grinding, hoisting, instrument control, molding and die casting, ramming, riveting, screw driving and nut running, spraying, and others. The text is supplemented by 13 tables.

Now you can get heavier than commercial electro-plated zinc-coated steel strip



When your production standards demand extra protection from corrosion you can get it now with the *double*, *triple*, and even *heavier* electrolytic zinc coated Thomas Strip. This cold-rolled strip steel has a dense, uniformly distributed peel-proof zinc coating that adds substantially to product life and appearance. Coated edges can be furnished in most sizes.

In addition to the extra heavy zinc coatings, Thomas has facilities to handle the heavier gauges of strip in coils or cut lengths—thickness limits up to .125" (full range .005" to .125")—widths 1/4" to approximately 22".

Thomas electro-plated zinc strip may be formed, bent, and drawn without affecting the bond or causing flaking. Now it is available in

commercial, double, triple, and heavier coatings. It can be furnished bonderized in strip thicknesses of approximately .050 and lighter to provide extra adherence for paint, lacquer, and enamel. To learn how to put extra quality into your products with precoated Thomas Strip write today.

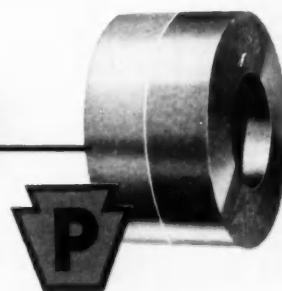
Cold-rolled strip steel electrolytically pre-coated with Zinc, Copper, Brass, Nickel, Lead-Alloy, and Chromium in Natural, Planished and Buffed Finishes—Hot Dip Tin and Lead Alloy Coated—Lacquer Coated in Colors—Annealed Spring Steel—Alloy Strip Steel—Uncoated Strip Steel. Carefully produced to your specifications.

Thomas Strip

a product of

Pittsburgh Steel Company

Thomas Strip Division • Warren, Ohio



CALENDAR

OF COMING SHOWS AND MEETINGS

Industrial Ventilation Conference,
Mich. State College, E. Lansing,
Mich.Feb. 16-19

Society of the Plastics Industry, 8th
Annual Conference of Reinforced
Plastics Div., Shoreham Hotel,
Washington, D. C.Feb. 18-20

National Transport Vehicle Show
and Fleet Maintenance Exposit-
tion, New York, N. Y.Feb. 25-27

World Motor Sports Show, Madison
Sq. Garden, N. Y. C.Feb. 21-Mar. 1

Pacific Automotive Show, Civic
Auditorium, San Francisco,
Calif.Feb. 26-Mar. 1

American Society for Testing Mate-
rials, Spring Meeting, Detroit,
Mich.Mar. 2-6

National Automobile Show, Mon-
treal, Que., CanadaFeb. 27-Mar. 8

SAE National Passenger Car, Body
and Materials Meeting, Sher-
aton-Cadillac, Detroit, Mich.Mar. 3-5

Geneva Automobile & Truck Show,
Geneva, SwitzerlandMar. 5-15

Chicago Automobile Show, Interna-
tional Amphitheater, Chicago,
Ill.Mar. 14-22

National Association of Corrosion
Engineers Ninth Annual Con-
ference and Exhibition, Hotel
Sherman, Chicago, Ill.Mar. 16-20

21st Annual Meeting, American So-
ciety of Tool Engineers, Hotel
Statler, Detroit, Mich.Mar. 18-20

Germany Vehicle Show, Frankfurt,
GermanyMar. 19-29

National Conference of Instrumen-
tation, Michigan State College,
E. Lansing, Mich.Mar. 19-20

27th Automobile Show, Civic Audi-
torium, San Francisco, Calif.
Mar. 21-29

Eighth Western Metal Congress,
Pan-Pacific Auditorium, and
Western Metal Congress, Stat-
ler Hotel, Los Angeles, Calif.
Mar. 23-27

SAE National Production Meeting,
Hotel Statler, Cleveland, O.
Mar. 25-27

International Magnesium Exposition,
National Guard Armory, Wash-
ington, D. C.Mar. 31-Apr. 2

2nd Annual International Motor
Sports Show, Grand Central
Palace, New York, N. Y.Apr. 4-12

Auto-Lite Easter Automobile Show,
Waldorf-Astoria, New York,
N. Y.Apr. 6-11

9th Annual Meeting and Show, Metal
Powder Association, Hotel Cleve-
land, Cleveland, O.Apr. 20-22

SAE National Aeronautic Meeting
and Aircraft Engineering Dis-
play, Hotel Statler, and Air-
craft Production Forum, Hotel
Gov. Clinton, New York, N. Y.
Apr. 20-23

World Auto Show, Municipal Audi-
torium, Long Beach, Calif.Apr. 22-26

Annual Turin Automobile Show,
Turin, ItalyApr. 22-May 3

British Industries Fair, London and
Birmingham, England, Apr. 27-May 3

American Society of Mechanical En-
gineers, Spring Meeting, Desher-
Wallach Hotel, Columbus, O.
Apr. 28-30

Fifth Materials Handling Exposit-
tion, Convention Hall Philadel-
phia, Pa.May 18-22

Society for Experimental Stress
Analysis, Spring Meeting, Hotel
Schroeder, Milwaukee, Wis.May 20-22

American Gear Manufacturers As-
sociation, Annual Meeting, The
Homestead, Hot Springs, Va.
May 30-June 3

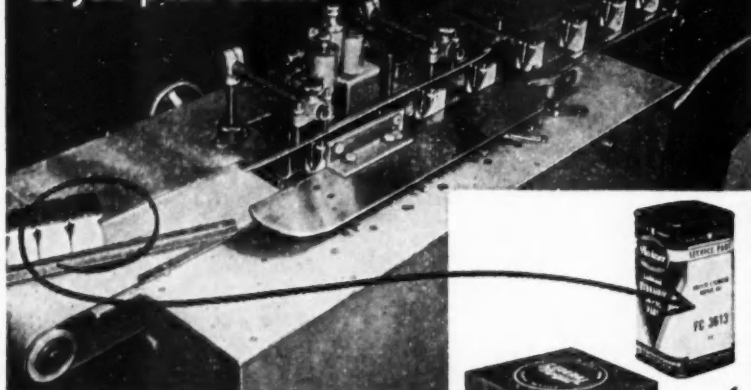
SAE Summer Meeting, The Am-
bassador and Ritz-Carlton, At-
lantic City, N. J.June 7-12

Exposition of Basic Materials for
Industry, Grand Central Palace,
New York, N. Y.June 15-19

American Society for Testing Ma-
terials, Chalfonte-Haddon Hall,
Atlantic City, N. J.June 29-July 3

Eighth National Instrument Con-
ference and Exhibit, Chicago,
Ill.Sept. 21-25

How much can your company
save...by printing packages
as you pack them?



Do you use completely preprinted packages for each individual part or accessory you make? Or do you use a common package for a variety of products, imprinting or labeling it in a separate operation? Either way you can cut costs considerably and do a more efficient job with a Gottscho MARKOCODER automatic package printing machine.

Set up in either a hand-pack or mechanized packaging line the MARKOCODER prints name, number, model application, other product identification on one or more blank panels of a partially-printed container...automatically... as an integral packaging function. It delivers accurately registered "print-quality" impressions on cartons, boxes, cans or canisters...on top, ends or bottom—permits quick, easy change-over for new copy, packages of different size.

Find out how other packagers of parts and accessories are using the Gottscho MARKOCODER to slash package inventories and save storage space, eliminate a cause of production line down-time, reduce packaging labor costs, reduce cost of packages, cut losses from package obsolescence, simplify inventory control, etc. Send for our MARKOCODER Brochure "APM" today.

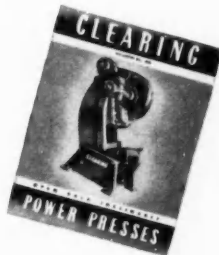
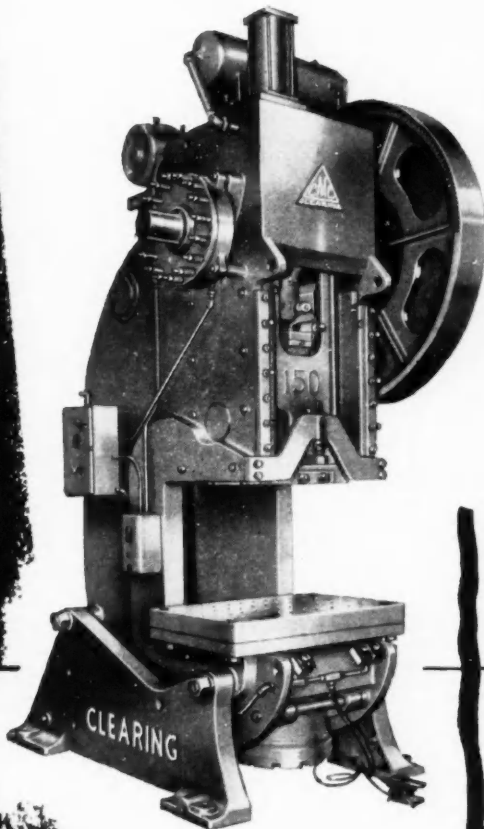
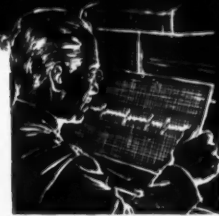


Gottscho

ADOLPH GOTTSCHO, INC., Hillside 5, N. J.

Machines to MARK whatever you MAKE

An Electrocardiogram for an O.B.I.?



SEND FOR THIS CATALOG

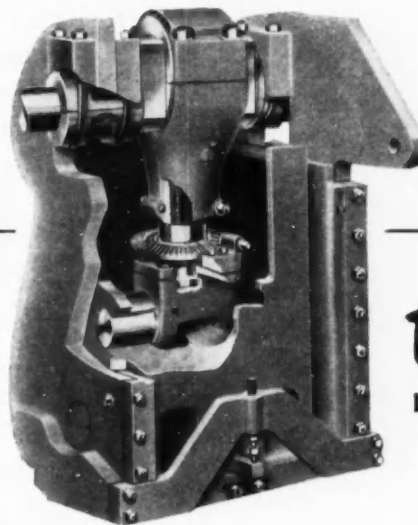
It will show you what you
get in a Clearing O.B.I.
Write for free copy today.

What if doctors could re-design the human body? Maybe the first thing they'd do is strengthen the heart—fix it so it wouldn't give out before its time. A tough job for the doctors, but with presses it's a different matter. Because for years that's essentially the kind of treatment open back inclinable presses have had from Clearing engineers.

That's why the frames are all steel weldments, with more rugged bearings, pitman connections and adjustments. Clearing designers have analyzed functional disorders and engineered preventive maintenance into the press. So if you're looking for presses that stay young and trouble-free longer, find out about Clearing inclinables.

CLEARING MACHINE CORPORATION

6498 WEST 65TH STREET • CHICAGO 38, ILLINOIS
HAMILTON DIVISION — HAMILTON, OHIO



Illustrations on this
page are of the
Clearing 150 ton in-
clinable press.

R_x FOR A
LONG, USEFUL
LIFE

- 1 **FRAME**—All steel welded, fully stress relieved. Ample reinforcing at critical points.
- 2 **BEARINGS**—Long wearing bronze. Split cartridge type for easy servicing.
- 3 **ADJUSTMENT**—Adjustment screw buttress threaded for greater strength. Easy to adjust in fine increments.
- 4 **CONNECTION**—Wrist pin supported from below eliminates shear stresses. Unique construction keeps dirt out of bearing surfaces.
- 5 **GIBS**—Extra long, bronze lined. Square gibs in rear hold finer alignment. Both front gibs adjustable.

INCLINABLE PRESSES FROM 30 TO 200 TONS

CLEARING PRESSES

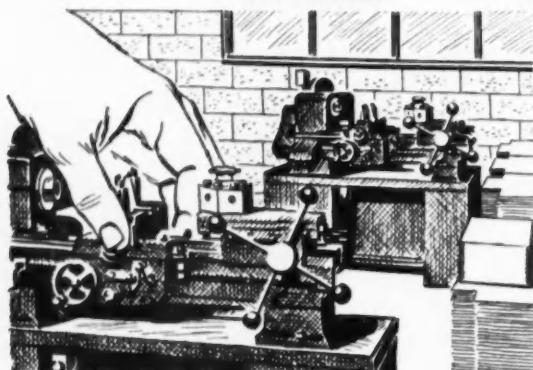
THE WAY TO EFFICIENT MASS PRODUCTION



how **METAL EDGE** paid packaging dividends in 3 typical industries

OUR BAGS GOT THE SACK!

"Now our tire chains reach the customer protected by bright, sturdy M.E. boxes. Dealers get them in perfect condition, give them better display, and customers like their re-use value."



ROOM FOR 2 MORE LATHES!

"We store M.E. flats in 20% of the space required for set-up boxes—and assemble them only as needed. This made room for two turret lathes, while eliminating delays in packaging our replacement parts."

ORDERS ARE EASIER!

"M.E. cut our box needs to a few basic sizes—to package socket head screws and screw machine products in standard quantities. We get faster, more accurate order-filling and inventories . . . plus more attractive packages."



METAL EDGE—the engineered method—has solved diverse packaging problems in over 100 American industries.

NATIONAL METAL EDGE BOX CO.

PACKAGING • MATERIALS HANDLING • INVENTORY CONTROL

1208 Callowhill Street, Philadelphia 23, Pa.



MEN in the NEWS

(Continued from page 25)

Hudson Motor Car Co.—Charles W. Hunter has been appointed general superintendent of the Air Frame Div. Louis A. Wehde was named special representative on the sales manager's staff.

Nash Motors Div.—With N. F. Lawler appointed Central division sales manager, J. B. Huntress and L. E. Stewart will become advertising manager and sales promotion manager, respectively. J. S. Krider is now assistant parts and accessories manager, and R. S. Nilsson is supervisor of warehouses, Milwaukee parts plant.

Seiberling Rubber Export Co.—Claude Pitts has been named vice-president and general manager, succeeding Harris A. Waite who has retired.

Caterpillar Tractor Co.—Recent appointments at the York, Pa., plant raised L. C. Allenbrand to general manager, Hans Erich to factory manager, and Frank Bovenschulte to company merchandising manager.

Jensen Specialties, Inc.—Burton Zook is now sales manager for the firm's line of ovens and heating equipment.

Kold-Hold Mfg. Co.—S. J. Stowell recently became merchandising manager.

Aeroequip Corp.—The election of Matthew J. Bentley and George Fischer as vice-presidents has been announced.

Raybestos - Manhattan, Inc.—W. Ward Kievit succeeds the late George R. Weber as treasurer, and W. S. Simpson succeeds retiring Robert B. Davis as general manager of the Raybestos Div.

Ford Div.—Chester E. Bowie succeeds retired J. D. Ball as manager of product sales and services.

Cleveland Graphite Bronze Co.—Carl P. Cronk has joined the firm as manager of sales planning and research.

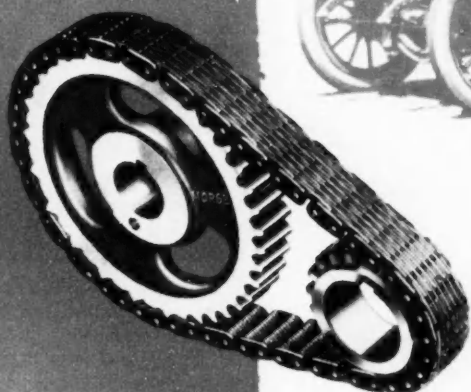
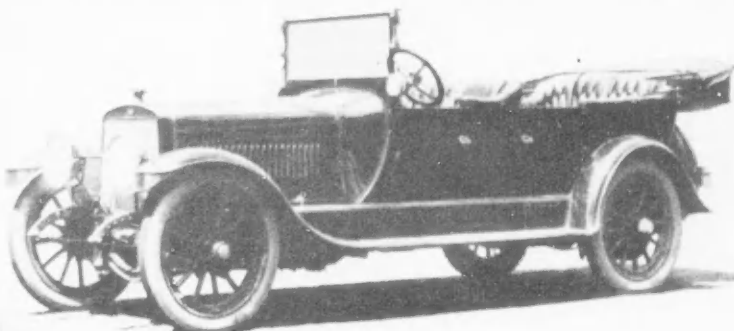
Continental Motors Corp.—Richard Creter will manage the company's newly-established Eastern division, at New York City.

(Turn to page 138, please)



TALK OF THE TOWN IN

1914



...and **55,000,000**
motor cars since have
used *MORSE* Chains

The builders of that classy "Lozier" were among the first to recognize the correct engineering principle and remarkable dependability of Morse Chains in motor car performance.

Today Morse timing chains and other Morse transmission products are almost universally preferred for original equipment and for replacement use in practically every industry as well as in motor cars, trucks, buses, tractors and farm implements.

For 39 years Morse Chain—a unit of Borg-Warner Corporation has contributed to and shared in the progress and prosperity of the automotive industry. B-W's Morse Chain is another example of how



ENGINEERING MAKES IT WORK



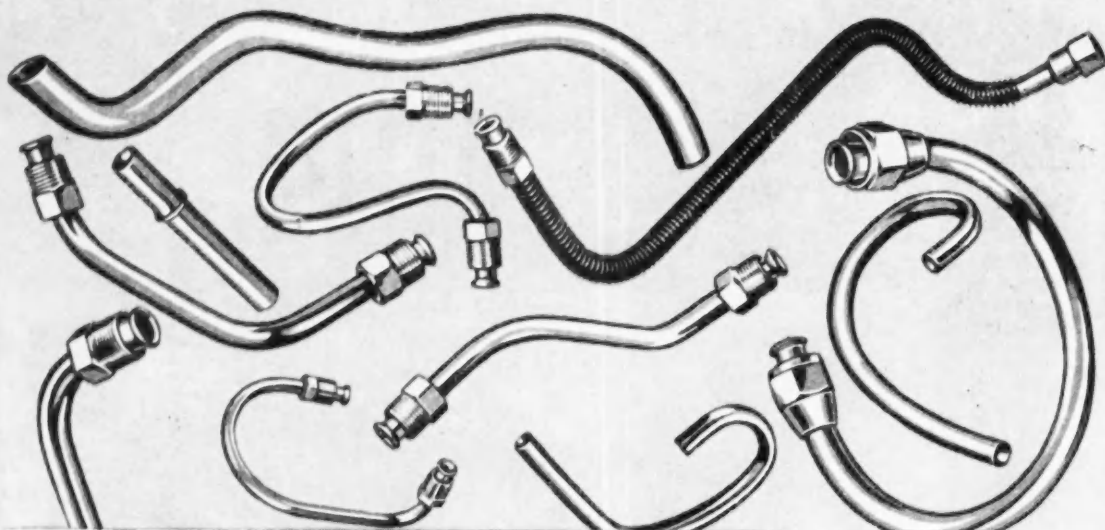
PRODUCTION MAKES IT AVAILABLE

Almost every American benefits
every day from the 165 products made by

BORG-WARNER

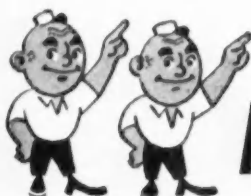


THESE UNITS FORM BORG-WARNER, Executive Offices, Chicago: ATKINS SAW • BORG & BECK
BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • CLEVELAND
COMMUTATOR • DETROIT GEAR • FRANKLIN STEEL • INGERSOLL PRODUCTS • INGERSOLL STEEL
LONG MANUFACTURING • LONG MANUFACTURING CO., LTD. • MARBON • MARVEL-SCHIEBLER PRODUCTS
MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO., LTD. • MORGE • MORGE HEAT
PESCO PRODUCTS • REFLECTAL • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE
PARTS • WARNER GEAR • WARNER GEAR CO., LTD. • WOOSTER DIVISION



Here is a small sampling of the variety of parts produced for Bundy automotive customers. Many of them involved close cooperation between Bundy engineers and the customers in solving problems of design and function. Are your tubing designs simple or complex? Do they call for swaging, flattening, expanding, brazing, saddle jointing, bending to

small radii, piercing, upsetting, slotting, threading, angle cutting, notching, flanging, flaring, reducing, tapering, other fabrication operations, or combinations of the above? Come to Bundy for the automotive industry's most reliable tubing, most helpful engineering talents, and most versatile fabrication facilities.



Almost no limit to what we can do for you with Bundyweld Tubing

WHY BUNDYWELD IS BETTER TUBING



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .

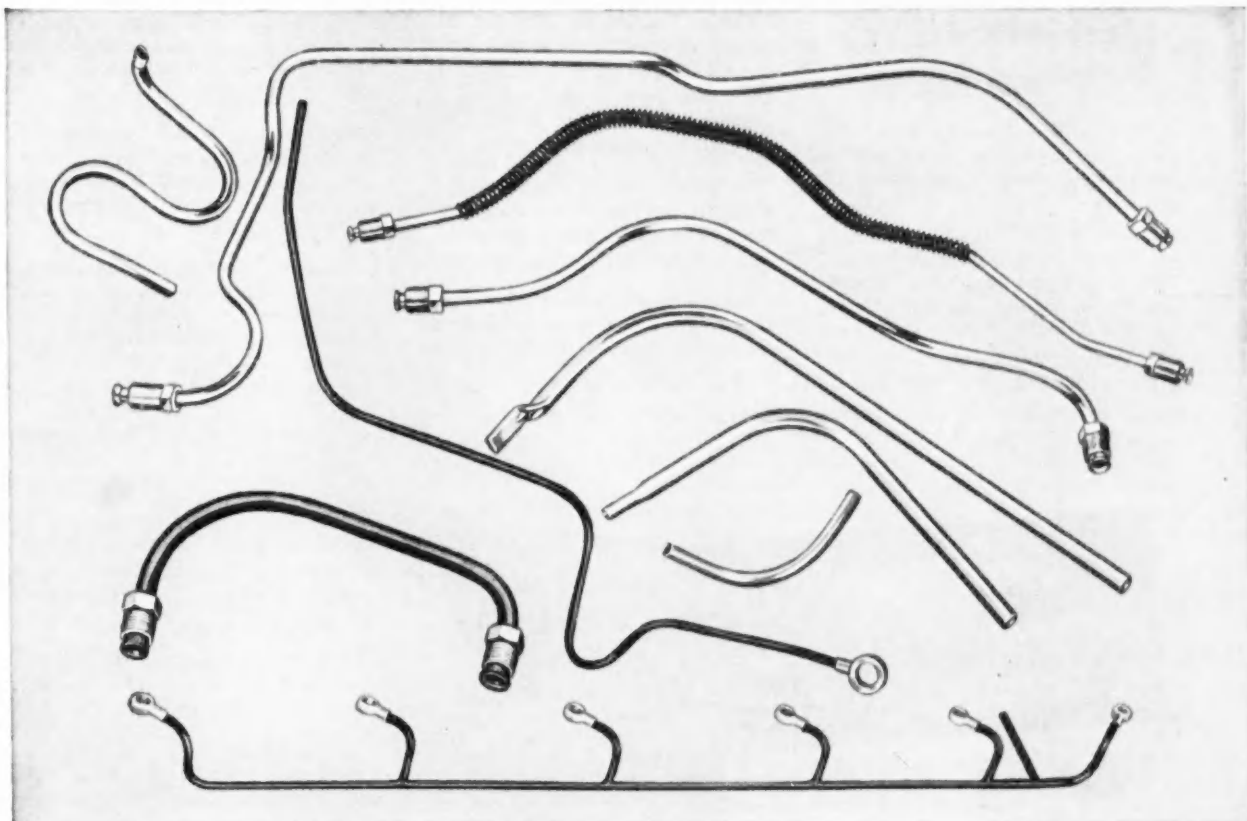


Bundyweld, double-walled and brazed through 360° of wall contact.



NOTE the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Pearson-Deakins Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Philadelphia 3, Penn.: Rutan & Co., 1717 Sansom St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave. South Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., East • Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.



It almost goes without saying that you can't beat Bundyweld for leak-proof, dependable performance in your brake, oil, and gasoline lines and in other tubing lines throughout your cars, trucks, or tractors.

But you get more than peace of mind with Bundyweld. For instance, you tap a wealth of fabrication facilities and engineering skills.

Do your tubing part designs call for difficult fabrication operations or easy ones? Do the designs call for unusual combinations of operations? Do they create problems that may seem unsolvable?

If your needs call for a tubing part that is at all produceable, you can count on us to do the job—exactly to specifications at lowest possible cost to your company. But say it isn't produceable. What then?

Just this. Bundy engineers who know their Bundyweld and automotive tubing problems inside and out will work with you personally until problems turn into solutions. This help and teamwork pay off in time and trouble saved. And such a pooling of specialized skills—yours and the Bundy man's—frequently pays off in lowered material costs and lowered production costs, too.

What if your company is geared for low-cost fabrication? Wonderful. You can count on us to ship clean, carefully inspected Bundyweld on time and in specified straight lengths. Of course, you can still summon all the engineering help you can use.

For tubing that's the standard of dependability, for fabrication facilities and engineering talents devoted to producing better parts at lowest possible cost, come to headquarters for small diameter tubing.

**BUNDY TUBING COMPANY
DETROIT 14, MICHIGAN**

Bundyweld Tubing®

DOUBLE-WALLED FROM A SINGLE STRIP



MEN in the NEWS

(Continued from page 134)

Carboloy Dept., General Electric Co.—**William A. Reich** has been appointed manager of advance development engineering.

Bowen Products Co.—The new board of directors includes **L. A. Young, Jr.**, **Mrs. L. A. Young, Sr.**, **Burke N. Carson**, **W. H. Hughes, Jr.**, **E. R. Tharp**, and **H. B. Arnold**. **William H. Steelow** has returned to the firm as vice-president in charge of manufacturing.

Gisholt Machine Co.—**Ralph J. Miller, Jr.**, and **Carl F. Welke** have joined the firm's sales staff at Chicago and Cleveland, respectively. **George E. Thomas** retired as New England representative last month.

Lockheed Aircraft Corp.—**Jim M. Wade, Jr.**, has been named administrative coordinator in administrative engineering at the Marietta, Ga., plant.

Detroit Steel Products Co.—**David S. Burnett** is now sales manager of the automotive division, succeeding retiring **Samuel P. Hess**.

Marbon Corp., subsidiary of Borg-Warner Corp.—Election of **D. Morris Pratt** as a vice-president has been announced.

Borg-Warner Corp.—Appointment of **Ray P. Johnson** as director of sales research and **Alonzo B. Kight** as administrative assistant to the president was announced recently.

Norton Co.—At the annual meeting, **John Jeppson**, formerly assistant secretary and works manager, was appointed a vice-president. **A. D. Kelso**, president of Norton Behr-Manning Overseas, Inc., was named vice-president in charge of foreign operations and a director. **Howard J. Daly** was elected to the board, and **Richard Prouty** was promoted to assistant secretary.

Bingham-Herbrand Corp.—Promotion of **Robert Griffin** to general superintendent of the aviation division has been announced.

Price Battery Co.—**J. H. Meyers** was named manager of the truck, bus and marine division.

Bowers Battery and Spark Plug Co.—**Richard D. O'Brien** has been named director of sales of all branches and warehouses.

Gray Associates, Inc.—Newly-named vice-presidents were **Robert E. Kilgore**, who also became secretary and a board member, and **Arthur J. Brooks**.

Weber Aircraft Corp.—**Ed C. Jacoby** has been named manager of the contract administration department.

North American Aviation, Inc.—**William H. Cann** has been appointed assistant to the president.

Solar Aircraft Co.—**Earl D. Foster** was named superintendent of gas turbine production at the San Diego manufacturing division. Solar has also established a gas turbine field service unit under **Fritz C. Heinig**.

Transport Air Group—**Thomas L. Grace**, president of Slick Airways, was elected president of TAG and **L. R. Hackney** executive vice-president.

General Petroleum Corp.—**Baxter F. Ball** is now sales manager of the marketing department.

Temco Aircraft Corp.—**W. N. Hall** has been promoted to superintendent, and **Herman Muller** was promoted to superintendent of overall night operations.

(Turn to page 140, please)

Chicago RIVET "912"

AUTOMATIC RIVET SETTER

CUTS COSTS 3 WAYS

1 FASTENS FASTER . . .
Only the speed of the operator limits the 912's riveting speed. Completely automatic. A push on the foot pedal automatically feeds, inserts and clinches the rivet.

2 DOES WORK OF SEVERAL MACHINES
Quick change rotary hopper and race-way makes the 912 adjustable in 5 to 10 minutes to set different size rivets. Adjustable anvil height and 12-inch throat provide further versatility.

3 SAVES ON MAINTENANCE . . .
The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.
If your assembly calls for 3/16" steel tubular rivets or smaller, of 15/16" lengths or less, ask us to show you how the 912 can cut your fastening costs. Send a sample of your problem assembly (or blueprint) for a free fastening analysis.





FREE CATALOG

contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.

9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
Branch Factory: Tyrone, Pa.



Save time... slash costs... switch to Black & Decker POWER!

YOU don't have to be an engineering genius to sell yourself on Black & Decker Tools! Their performance hits you right between the eyes as they gobble up job after job . . . saving money, muscle and man hours. Their modern design sticks out in streamlining, light weight and perfect balance that mean easy handling. And their quality construction is proved by tools that put out and pay off for year after year after year!

That's why they've won their spurs with millions of men who take a long, hard look at *any* tool . . . production bosses, maintenance men. That's why we'd like you to put them to the test. Ask your friends about them. Ask your nearby Black & Decker Distributor for a demonstration. Write for our free, detailed catalog of over 100 time-saving, cost-cutting Portable Electric Tools to: **THE BLACK & DECKER MFG. CO., 606 Pennsylvania Ave., Towson 4, Maryland.**

LEADING DISTRIBUTORS EVERYWHERE SELL

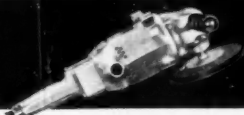


Black & Decker

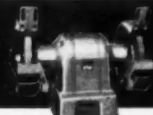
PORTABLE ELECTRIC TOOLS



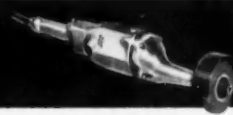
DRILLS . . . Models and speeds to fit any job in capacities from $\frac{1}{4}$ " to $1\frac{1}{4}$ " in steel, double in hardwood. Many attachments.



SANDERS . . . Drive abrasive discs, wire cup brushes, saucer grinding wheels, other attachments. Four models, 7" and 9" capacities.



BENCH GRINDERS . . . Three models, 6"-10" wheel diam., $\frac{1}{4}$ to 1 H. P., for sharpening, grinding, wire brushing, buffing.



PORTABLE GRINDERS . . . Bring the tool to heavy, bulky, hard-to-move work. Perfectly balanced, 3", 5" and 6" wheel diam.



HAMMERS . . . Drive gear drills, bull points, chisels, etc., for work in masonry, other materials. Four models, rated by capacity in concrete for $\frac{1}{2}$ " to 2" diam. holes.



PORTO-SHEARS* . . . For fast, accurate cutting of ferrous and non-ferrous sheet metal. Two models, 12 and 16 gage capacities in steel. Cut to small radius.



SCREW DRIVERS . . . Drive anything from delicate screws to large nuts and bolts. Many models, positive and adjustable clutches, 190° angle models for close-quarter work.



FACTORY SERVICE . . . A Black & Decker *extra!* Nationwide network of company-operated branches within 24 hours of *any* customer provides fast, accurate, reasonable service.



WRITE TODAY FOR 1953 BLACK & DECKER CATALOG. Gives you full details on over 100 Tools and hundreds of useful accessories. Fill out the coupon below or attach it to your letterhead.

*Trade Mark Reg. U. S. Pat. Off.

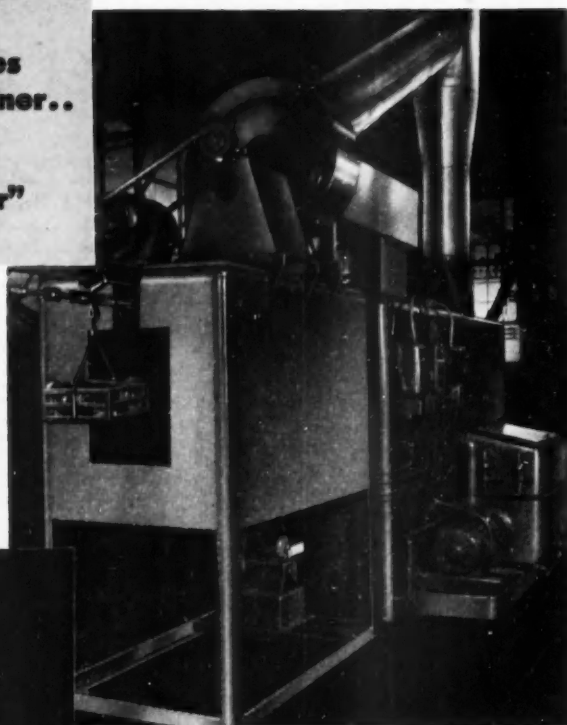
THE BLACK & DECKER MFG. CO.
606 Pennsylvania Ave., Towson 4, Maryland
Please send me your free 1953 catalog of over 100 Black & Decker Tools.

Name _____
Company _____
Address _____
City _____ Zone _____ State _____

**"washes
cleaner..**

**dries
dryer"**

**"DOES
EXCELLENT
JOB ON
HARD-TO-CLEAN
PARTS"**



noted gear manufacturer reports on

Cincinnati CLEANING MACHINE

This Cincinnati engineered cleaning system at New Process Gear Corporation processes 20 gears per minute prior to inspection and assembly. Grease, oil and coolant are removed from difficult areas without injuring the easily-damaged parts. Smaller parts are cleaned even faster.

Typical benefits of Cincinnati engineering are illustrated in the heating system of this machine. To obtain maximum efficiency from the gas-fired heaters, combustion products are used in the hot air-blow-off. The heating system itself is equipped with a specially designed, gas-fired, submerged tube designed to utilize maximum heat content of the gas.

If cleaning and finishing are part of your production, a Cincinnati machine can increase efficiency, save time and lower costs. Write for full information.

Catalog available on request.

CINCINNATI CLEANING AND FINISHING MACHINERY CO., INC.
315 HECLA STREET, IRONTON, OHIO



MEN in the NEWS

(Continued from page 138)

Willard Storage Battery Co.—Robert S. Maddox has been named advertising service manager.

Wettlaufer Mfg. Corp.—Herbert J. Wettlaufer has joined the firm as vice-president.

Rosan, Inc.—Gaither Littrell was appointed director of public relations.

Bardwell & McAlister, Inc.—Cecil Bardwell has rejoined the firm as director and vice-president.

GM Tests Own, Rivals' Cars in Torture Run

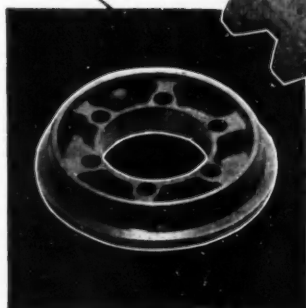
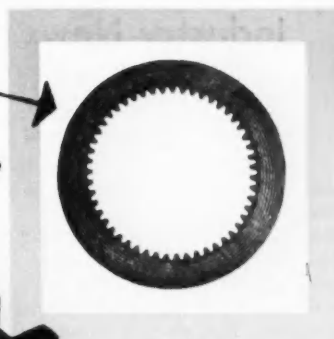
(Continued from page 21)

each, day and night, five days a week for about 13 weeks. An indication of the grueling nature of the test is tire mileage, which averages about 8000 miles. General Motors estimates that the test is equivalent to about 100,000 miles of ordinary driving.

Objective of the test is to determine how each car performs and accurate records are kept on each unit as to parts failure, cost of replacement parts and labor cost for installation, fuel and oil consumed, number of tires worn out, frequency of required adjustments, and many other items which comprise operating costs for the car owner. All cars are maintained in accordance with the particular manufacturer's recommendation. At the conclusion of the test the cars are torn down to the last nut and bolt and components are examined carefully for wear or need of replacement. In running the test, GM goes to great lengths to maintain impartiality so that all cars get the same maintenance and are put over exactly the same routes at identical speeds. Also, drivers are switched from car to car with each driving all vehicles in the test about the same mileage.

The course includes highspeed track, steep grades, Belgian block, and other rough surface roads. Acceleration, hill climbing, stopping ability, and other performance characteristics are tested carefully as are all functional components, such as horn, lights, windshield wiper, radios, and heaters. Unfortunately, comprehensive results of the test are available only to top executives in General Motors engineering and its car, body, parts, and research divisions.

**When Moraine
friction materials go in . . .**



Moraine friction materials are well known for their efficient performance in automatic transmissions such as Hydramatic, Powerglide, and Dynaflo. They have additional applications in automotive and other fields that may lead to improved performance at less cost. These include special military equipment, household appliances, and automatic transmissions for com-

mercial trucks of every size and military vehicles.

Having proved to industry our ability to mass-produce friction materials utilizing powder metallurgy and/or semi-metallic or non-metallic facings, we may be in a position to help you.

If you need substantial quantities of parts incorporating friction material facings, please feel free to contact us—at any time.



**moraine
products**

DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

Industry News

(Continued from page 23)

Soreng Products Formed

A newly organized manufacturing concern known as the Soreng Products Corp. has acquired ownership of the Soreng Manufacturing Corp. of Schiller Park, Ill., and Sampsel Time Control, Inc. of Spring Valley, Ill. The concerns manufacture solenoids, switches, and electric terminals for the home appliance, automobile and

aircraft industries, and for suppliers.

E. M. Soreng will be chairman of the board, a director and a technical and sales consultant. President of the new concern will be Louis Putze, who for the past six years has been president of Sampsel. The new company will begin operations immediately and will have its headquarters in Schiller Park.

Ford Employment Peaks

Ford Motor Co. employment reached 164,427 last month the highest since 1944. At the same time, Ford

payrolls reached an all-time peak of \$73.8 million a month compared to a monthly average of \$44.6 million in 1944 when Ford employed 167,978.

Of Ford's current employment, 124,154 are hourly and 40,273 are salaried. The previous post-war employment peak was in September 1950 when 154,486 worked for the company.

Aluminum Mill for Coast

Construction of the first aluminum rolling mill on the Pacific Coast will begin soon at the Torrance, Calif., plant of Harvey Machine Co. The new \$20 million plant will produce aluminum sheets, strips and circular shapes. The mill is to be built as an integral part of the expansion goal set by the Defense Production Administration to increase facilities for the production and heat-treating of aluminum sheets and strips as a part of the defense program.

Kish Elects Officers

Kish Engineering, Inc., of Lansing, Mich., announced the election of directors and officers at the annual stockholders meeting.

Steven P. Kish, formerly president, was advanced to chairman of the board. The following officers were elected:

President, Robert E. Reineke; vice-president and treasurer, Charles E. Reineke; vice-president in charge of engineering, Joseph E. Whitesell; and secretary, Eva M. Reineke.

An announcement was also made of the appointment of three special consultants to the corporation: Joseph J. Kish of Detroit; Thomas H. McConnell, Jr., of New York, and Marvin A. Hawkins, of Lansing.

Kish Engineering, Inc., of 2707 E. Kalamazoo St., Lansing, Mich., is primarily engaged in engineering design in the automotive and aircraft fields with activities including both product and tool design.

Alcoa Research Grant

A new professorship in mechanical engineering has been established at Carnegie Institute of Technology through a grant from the Aluminum Company of America. Part of the grant of \$15,000 a year will be used for research and equipment.

The new chair will be named the Alcoa professorship in engineering. Educational support will be used to strengthen fundamental research in the general field of mechanical engineering, as well as in specific problems that exist in the aluminum industry.

(Turn to page 144, please)



WITH **Vacuum Testing**

**PRODUCTION LINE, HI-SPEED TESTING
FOR LEAKS IN CASTINGS, OIL PANS,
HOUSINGS, MECHANICAL SEALS, ETC.**



One man and a Whittington Vacuum Testing machine can easily and accurately test 2,400 castings in eight hours. The same man could test only 960 castings by the pressure method. Vacuum testing eliminates submersion, plugging of holes, clamping and the hazards attributed to pressure testing. Any part can be tested with no threat of distortion. For the inside story on vacuum testing

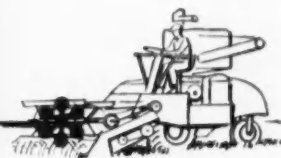
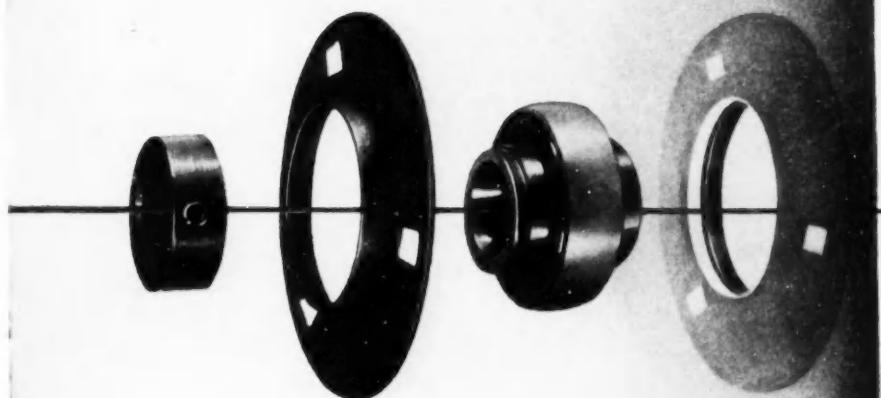
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**PUMP AND ENGINEERING
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The Idea that caught like *Wildfire!*



The Fafnir Flangette . . .
a pre-lubricated, com-
pletely-packaged ball
bearing.

This low-cost, easy-to-install ball bearing unit paved the way for important improvements in the design and construction of farm machinery and equipment. It cuts through cost barriers. It simplifies machinery construction. It improves overall performance. As a result, the advantages of ball bearings are available on more turning points today than ever before.

The Fafnir Flangette consists of a compact, lightweight housing of two, mated, pressed-steel flanges which can be bolted to almost any part of a machine . . . the famous Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar, easiest of all to install . . . efficient seals, which keep lubricant in and contaminants out. Flange design permits full self-alignment when installing.

This popular development reflects the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the manufacturer's viewpoint . . . an aptitude for supplying the right bearing to fit the need. Maybe this combination can help you find a better, more economical way to use ball bearings. The Fafnir Bearing Company, New Britain, Connecticut.



COOLIDGE BALLS CHROME ALLOY STAINLESS STEEL

Finest:
ELECTRIC FURNACE STEEL
HEAT TREATMENT
LAPPED FINISHES

THESE FACTORS COMBINE TO MAKE THE FINEST
STEEL BALLS OBTAINABLE BECAUSE THEY CON-
TRIBUTE TO CLOSER SURFACE UNIFORMITY—
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Used in:
BALL BEARINGS • AUTOMOTIVE • AIRCRAFT
FARM AND INDUSTRIAL EQUIPMENT
MACHINE TOOL • OIL WELL AND OTHER
IMPORTANT APPLICATIONS

COOLIDGE
CORPORATION
BOX 488 • MIDDLETOWN, OHIO

Industry News

(Continued from page 142)

Navy to Equip Plant for Reynolds Metals

Reynolds Metals Co. will put into operation an additional \$7.5 million of facilities at its McCook, Ill., plant under a contract with the Navy. The equipment will be purchased by the Navy and will include a rolling mill, reheat furnace, heat treating equipment, shears, and other metal working equipment. When the new facilities are in operation, production of extremely wide aluminum sheets and plates up to 35 ft in length will be possible. Work on the project is scheduled for completion by the end of this year.

C&A Adds Upholstery Mill

Acquisition of a new mill that will add 25 per cent to the company's production of synthetic fiber automobile upholstery was announced by Collins & Aikman, makers of nylon and multi-fiber automobile upholstery.

The new mill is at Siler City, N. C. Containing 150,000 sq ft and built for ready expansion on 40 acres of land, it is one of the most up-to-date and modern weave mills in the country. The one-story, windowless structure is air-conditioned.

New Stamping Business

Charles H. Judd, known nationally for his contributions to the stamping industry since 1935, has formed Judd Industries, Inc. The new corporation will specialize in small, progressive stampings, utilizing automatic feeds for high production items. Through the development of a new system of universal, basic tooling, small quantities may now be produced with new economies. The new corporation is also equipped to produce its own tools and dies. It favors the submission of assembly problems for solution through the utilization of stamped fasteners, clips, and assembled stamped products based on the economy of the progressive die method. One of the most interesting developments by Judd Industries, Inc. is a method of producing stainless steel stampings to eliminate die-galling and tool marks.

Officers are: C. H. Judd, president; Jeanne C. Judd, treasurer; John B. Calfee, secretary and assistant treasurer. Directors are C. H. Judd, W. C. Knerr, and J. W. Snider. Judd Industries, Inc. is located at 3148 West 32nd St., Cleveland 9, O.

(Turn to page 146, please)

It Takes **MORE**
than a
Collection
of Parts



To Make A **VICKERS** CUSTOM BUILT POWER UNIT



Improve
and
Simplify
Hydraulic
Design

Reduce
Installation
and
Maintenance
Costs

A Vickers Custom Built Power Unit is much more than a collection of parts . . . just as the machines you build are more than the castings, shafting, gears, motors, etc. that go into them.

The Vickers Unit is designed and built with the "know-how" obtained during more than a quarter century of experience in practically every kind of hydraulic operation, plus a thorough understanding of your needs. It is built exactly to your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., are in one compact and self-contained "package". It includes all needed hydraulic accessories such as oil filters, air cleaners, oil level gauges, fittings, etc. Hydraulic connections may

be grouped in a conveniently located manifold.

The result is simplification of hydraulic design and important savings in installation and maintenance costs. Vickers undivided responsibility for the entire hydraulic control system is another important advantage to both the machine builder and his customer. • Write for new Bulletin 52-45.

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WASHINGTON • WORCESTER

6053

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Industry News

(Continued from page 144)

Hall Lamp Expands

C. M. Hall Lamp Co., pioneer Detroit manufacturer of automotive lighting equipment, will complete, about Mar. 1, a \$400,000 addition to the Elwood, Ind., plant of its subsidiary, Indiana Die Castings, Inc., according to an announcement made by its president, Leonard O. Zick.

The new 40,000 sq ft addition will

double the capacity of the present facility. It will enable the company to take care of expanding sales of raw and finished zinc and aluminum die castings for the automotive, electrical appliance, and other fields, as well as to handle machining operations. It will give employment to between 200 and 300 additional men and women.

O. & S. Bearing Co. Moves from Detroit

O. & S. Bearing Co. will consolidate its Detroit operation with its subsidiary, Neveroil Products Co., at

Whitmore Lake, Mich., about 40 miles west of Detroit, late this month. The merged company will be known as O. & S. Bearing & Manufacturing Co. O. & S. Bearing will maintain sales and service offices in Detroit.

Detroit SAE Offers Awards for Papers

The Detroit Section of SAE is reminding junior members that technical papers are eligible for competition in the current Henry Ford Memorial Award competition which closes May 31. Four types of report are eligible: Papers prepared specifically for the contest; talks prepared as part of a scheduled program and presented at an SAE meeting; technical reports prepared for some other purpose and rewritten to suit the requirements of the competition, and college or technical school theses presented in a form to meet specified recommendations of the competition. To be eligible, members must be under the age of 33 prior to May 31. Detailed information about the competition and a brochure regarding the award may be obtained from the Detroit office of SAE in the Rackham Memorial Building, 100 E. Farnsworth St., Detroit.

Service Co. Expands

Modern Engineering Service Co. of Berkley, Mich., have increased their facilities to include tool, die and fixture fabrications as an added service to industry. With the purchase of a completely equipped new plant located at 22525 Hoover Road, Van Dyke, Michigan, the firm anticipates serving customers that require engineering design and tool fabrication as a combined service. The plant has 8000 sq ft of manufacturing area with overhead crane service.

Visitors from France See Ford Methods

The automobile industry in France suffers from high production costs and will have to borrow American manufacturing techniques to attain stature in the French economy. This is the consensus of a dozen French automotive parts manufacturers who made a day-long inspection of Ford Motor Co.'s \$35 million stamping plant in Buffalo, N. Y.

The French executives agreed that what France's auto industry needs most is more of American know-how. It must standardize and simplify production and improve working conditions for employees, the visitors said.

They added that cutting costs and increasing production depends to a large extent on the ability of the

(Turn to page 149, please)



The TUNG-SOL Flasher provides for an instrument panel pilot light with automotive direction signals.

*A Signal You KNOW
is working!*

Tung-Sol makes All-Glass Sealed Beam Lamps; Miniature Lamps; Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.

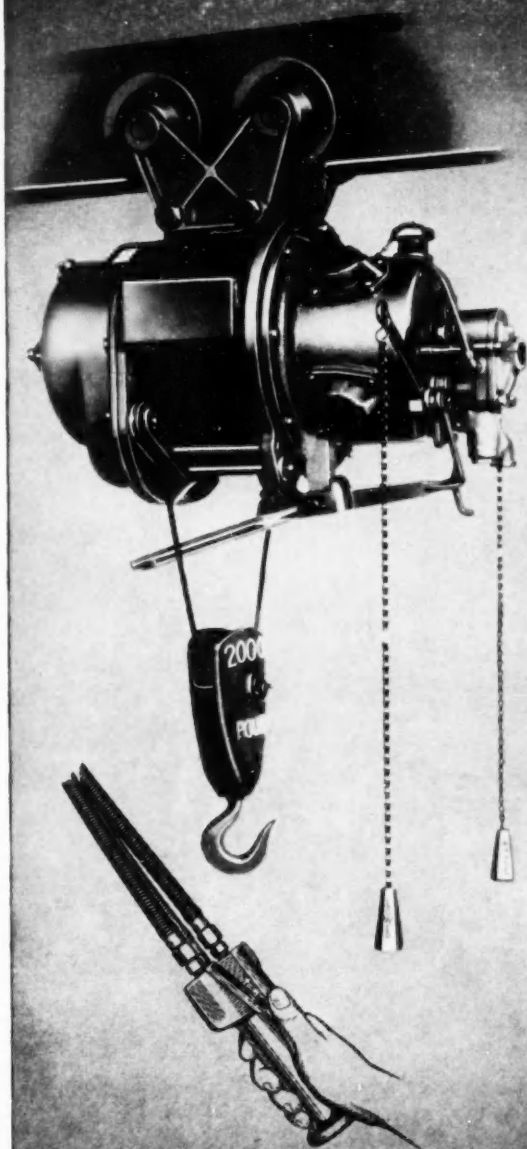
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WHY PRODUCTION MEN

Choose AIR HOISTS



"PENDENT THROTTLE"

ANOTHER  FIRST

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

HEAT—DAMPNESS—DIRT—WON'T HURT AIR HOISTS

Operating without the use of surrounding air for cooling, Ingersoll-Rand Air Hoists utilize internal pressure to keep out wet, hot, explosive or dirty atmospheres. They can be relied on for continuous operation with the minimum of maintenance. All moving parts are automatically lubricated.

COMPLETELY SAFE—LOAD CAN'T DROP

The Automatic Brake releases with air pressure only when the throttle is opened; therefore, even if the air supply should fail, the load cannot drop. The Automatic Safety Up- and Down-Stops prevent overrunning in both directions.

LIFT CONTROL FROM A SLOW CREEP TO TOP SPEED

The graduated Reverse Valve gives the operator complete control and permits accurate and easy spotting of the load. A Poppet-type Throttle prevents wasteful air leakage.

MORE HORSEPOWER PER POUND OF WEIGHT

Pound for pound Air Motors have more horsepower. There are eighteen standard sizes of Ingersoll-Rand Air Hoists, all having low air consumption, with capacities up to 20,000 pounds.

RUGGED CONSTRUCTION KEEPS THEM ON THE JOB

The time proven 4 cylinder, radial Air Motor features ball bearing support throughout, anti-friction bearings in the top hook and hook block, a groove type rope drum and a planetary gear system. All contribute to Ingersoll-Rand's reputation for dependability—many Hoists are still on the job after 20 years or more.

For special applications Ingersoll-Rand builds long-lift, low-head room and high capacity hoists. Let our application engineers make their recommendations without obligation to you.

801-B

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

*More automobiles, farm
and industrial machines
rely on C/R Oil Seals
than on any similar
sealing device.*



THE LEADERS LOOK TO THE LEADER

Minneapolis-Moline uses



In the Minneapolis-Moline harvester or combine shown, two C/R Oil Seals are used at points requiring an oil flooded bearing on one side and a dry brake on the other. That guarantees long bearing life and proper brake functioning at all times.

This job has two large heavy duty brakes that can be operated independently or together. If one wheel slips, it can be locked and all the traction transferred to the other.

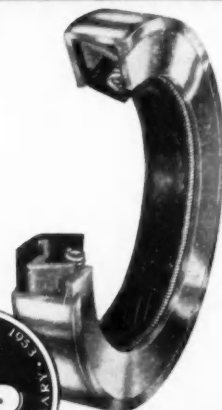
Minneapolis-Moline says this double C/R Seal is the most interesting application they have in their whole line of products. It protects a vital point in this tractor.

This is another example of the leaders looking to the leader, for research, engineering and manufacture of the highest type. If you have a particularly tough lubricant sealing or dirt exclusion problem, put it up to Chicago Rawhide engineers.

C/R, the most widely used oil seals, are stocked in over 1,800 sizes covering 16 different types for immediate delivery. Our free handbook, "Engineering with C/R Oil Seals" belongs in your files. Allow us to send it to you.

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Manufactured and distributed in Canada by
Super Oil Seal Mfg. Co., Ltd., Hamilton, Ont.

Industry News

(Continued from page 146)

French automotive parts and accessories industry to standardize products. The relationship between car makers and parts manufacturers is quite unsatisfactory, they said. The French automotive industry is handicapped by the unwillingness of the big auto makers to accept the parts manufacturers as partners in production planning, the visitors explained.

New Steel Shot Plant

American Wheelabrator & Equipment Corp., Mishawaka, Ind., has just completed construction of a new plant specially designed for the manufacture of Wheelabrator steel shot, a blast cleaning abrasive produced under the company's patented process. The plant, now in operation, is completely mechanized and equipped with electric melting furnaces and automatically controlled heat treating equipment to assure constant uniformity of product.

The abrasive, as invented and developed by this concern, is a carbon tool steel which is said to offer increased economies in metal cleaning operations by reducing abrasive consumption, reducing equipment maintenance, and increasing cleaning efficiency.

G-U to Build 20th Plant

Acquisition of a five acre plant site at Houston, Texas, was announced by Globe-Union, Inc. Construction of a 40,000 sq ft plant for the manufacture of storage batteries will begin immediately. It is expected that the new plant will be in operation by the middle of the year.

GE Adds to Test Facility

The Air Force has approved the construction of a million dollar addition to the General Electric Co.'s plant near Johnson City, N. Y. The new soundproofed building will be used for controlled testing of aircraft armament systems being built by GE for Air Force bombers.

Construction is expected to begin in a few weeks.

B-R Buys Lull

Purchase of the Lull Manufacturing Corp., Minneapolis, by the Baker-Raulang Co., Cleveland manufacturer of industrial lift trucks, tractors and cranes, was announced recently. It is planned to operate the Lull organization as a wholly-owned subsidiary of Baker-Raulang under the name of the

(Turn to page 150, please)

TESTING TOPICS

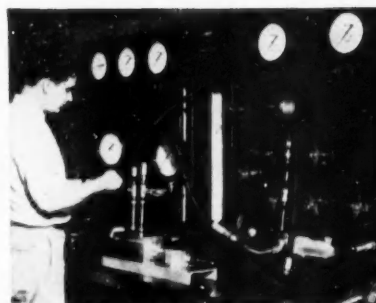


GREER DYNAMIC HOSE TEST BENCH tests statically one to six hose lines or similar components at pressures to 25,000 psi. Covered burst chamber provided for operator's safety. Above many hose assemblies are tested simultaneously.

Why Chance Vought Checks with Greer Testers



CHANCE VOUGHT'S CUTLASS AND CORSAIR, mighty single-place fighters, on a test run before being delivered to the U. S. Navy and Marines for combat.



GREER DYNAMIC HYDRAULIC TESTER checks all hydraulic accessories except pumps. Operates with variable volume and pressure dynamic tests to 5,000 psi, static tests to 15,000 psi, flow rates to 16 gpm. Above, check valves for tandem boost of Cutlass are being tested.

Like other aircraft builders, Chance Vought relies upon the accuracy and dependability in Greer Precision Test Equipment

No one knows the urgency of accurate testing better than the men who build the famous Cutlass and Corsair. It is a fine tribute to the Greer reputation that Chance Vought chooses Greer equipment for vital testing operations.

Again and again, leaders in the aviation field turn to Greer for maintenance and test equipment. Pioneers in this field, Greer has standardized its machines until you can order them for most purposes right out of a catalog (write for your free copy on company letterhead).

For out-of-ordinary test or maintenance requirements, a staff of creative engineers is ready to talk with you at your convenience.



Greer Hydraulics Inc. 454 Eighteenth St., Brooklyn 15, N. Y.

Field Offices: 407 S. Dearborn Street, Chicago • 298 Commercial Building, Dayton • 2832 E. Grand Blvd., Detroit and representatives in all principal cities • Also manufacturers of Accumulators and other hydraulic components.

Industry News

(Continued from page 149)

Baker-Lull Corp. LeGrand Lull, founder of the Minneapolis company, becomes a director of the new subsidiary and the parent company as well, as a result of the transaction.

This purchase, Moran said, is a move to provide added resources for expansion and development for Lull, and to widen the product lines of the parent company.

The former Lull Corp. produces

heavy-duty industrial lift trucks in capacities to 30,000 lb and owns patent rights to the "Travel-loader"—a side-loading lift truck. It also manufactures front-end loading tractors in capacities up to 10,000 lb.

Titeflex Appoints PAC as Distributor

Pacific Airmotive Corp. has been named a distributor for all aviation products manufactured by Titeflex, Inc. Seamed and seamless metal hose, ignition harnesses, and ignition shielding manufactured by Titeflex will be

sold nationally and for export by PAC's five sales branches.

Ore Stocks Higher than Last Year

In spite of the strike last summer which cut off practically all lake shipment of iron ore to steel mills for nearly two months, stocks on hand as of Jan. 1 were higher than for the same date a year earlier. The stockpile is estimated at 45,171,753 tons at the first of this year compared with 43,710,650 a year ago. This does not necessarily mean that the steel industry is any better off on its winter stockpile, however, since steel making capacity has increased in the last year and consumption of ore is heavier. Nevertheless, steel makers are optimistic about getting through the season with stocks on hand and what can be brought in by rail until the shipping season opens again.

Curtice Confirmed

(Continued from page 19)

M. Kyes as general manager of the GMC Truck & Coach Division who was confirmed by the Senate as Deputy Secretary of Defense Jan. 30. The resignation of Mr. Kyes as vice-president of General Motors and a member of the administration committee also became effective when he was confirmed by the Senate.

Mr. Hoffman, former president of Studebaker, who resigned as head of the Ford Foundation, will return as chairman of the board, effective March 1. Harold S. Vance, who will continue as president and chief executive officer of Studebaker, pointed out that Mr. Hoffman has been associated with the company for 38 of the past 42 years. He became a dealer salesman in 1911, and was named vice-president of the company in 1925 after becoming Studebaker's largest distributor-dealer on the West Coast.

In 1935 Mr. Hoffman was named president and Mr. Vance was named chairman. They served together until 1948 when Mr. Hoffman was granted leave of absence to become the first administrator for the Economic Cooperation Administration. In 1950 he became president of Ford Foundation.

Mr. Vance announced he has accepted appointment as a defense production consultant for the Office of Defense Mobilization. It has been reported that he was offered the post of director of ODM but declined. In his new position he will not be required to dispose of his stock holdings in Studebaker, since he will have no authority to make decisions in dealings with defense contractors. He will retain his post at Studebaker.

**Improved Design
Boosts Preference For
FLEXON THERMOSTATS**

**Integral Stem Guide
Aids Trouble-Free Service**



FLEXON THERMOSTATS feature the only important Thermostat improvement in years

The Flexon Thermostat is a bellows type, precision built instrument designed with a new aid for proper heat control—the integral Stem Guide. The guide is accurately stamped as part of the top plate and provides precision centering and control of the stem. This means positive seating of the valve and true alignment for dependable performance. We will be pleased to discuss your requirements with you and show you how Flexon Thermostats can help you. Write, wire or phone, today.

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Flexon identifies
CMA products that
have served industry
for over 50 years.



Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components. In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario



Send for free print

This chain-driven 1902 model featuring step-up design was one of the very first Franklin automobiles sold.

This is one of a series of old automobile prints that will appear in future Morse advertisements. Write for your free, enlarged copy, suitable for framing for your collection.

From the Bettmann Archive

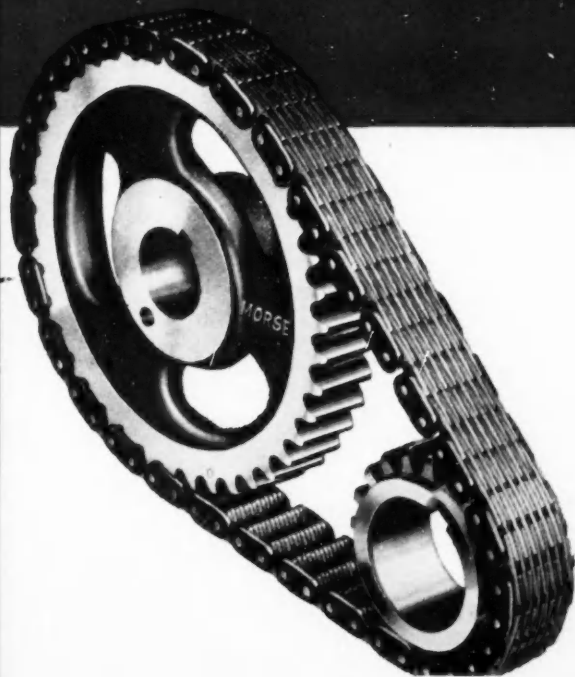
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M=TC

Morse means Timing Chains

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When you specify Morse Timing Chain Drives, it almost goes without saying that you get timing drives with a solid reputation for long, dependable service life in millions of cars, trucks, and buses.

You also get highly specialized engineering help in overcoming design or function problems.

Because of the proved quality of the timing chain drives and the proved quality of the engineering help, M=TC; Morse means Timing Chains to the automotive industry.

MORSE CHAIN COMPANY

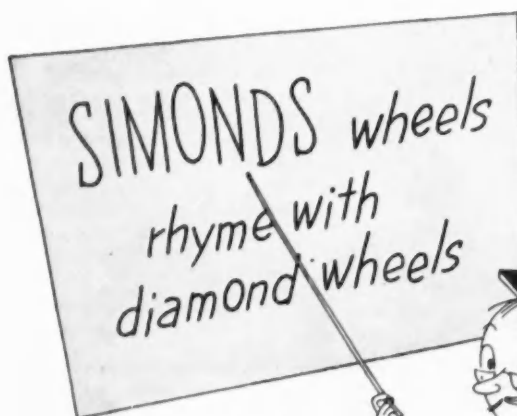
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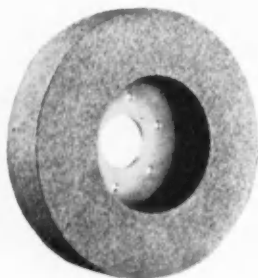
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Detroit 10, Michigan



but...for carbide
tool grinding
SIMONDS WHEELS
cost much less



Sharpen your carbide tools the economical way. Avoid damaging sensitive edges. Prevent shape distortion. Use Simonds' G Electroton (silicon carbide) grinding wheel. It's the popular "green" wheel... less expensive than diamond wheels... but a "gem" for safe, cool grinding that prolongs tool usefulness.

Especially efficient for roughing and semi-finishing, these wheels are also frequently used for finishing, too. Made to high standards of accuracy, as are all Simonds Abrasive Company products... including grinding wheels, mounted wheels and points, segments and abrasive grain.

Write for your copy of our bulletin (ESA 181) about G Electroton wheels, including type PM (plate mounted) and tool and cutter shapes—All available from stock. Your Simonds Abrasive distributor is equipped to serve you locally. We'll gladly send you his name too.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

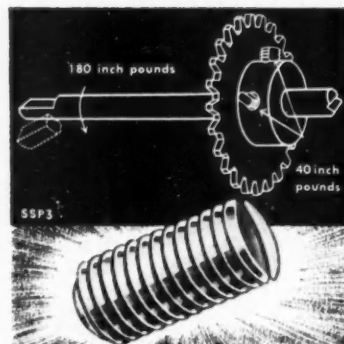
New Products

For additional information please use
postage-free reply card on page 65

(Continued from page 64)

Set Screw for More Holding Power

Now available is a type of set screw known as "Nu-Cup." The cup point of the screw is said to be designed so that the user is able to obtain greatly increased holding power with the same amount of setting torque. Diameter of the cup circle is reportedly quite large and distribution pressure is spread over a wider area.



It is claimed that the screw is particularly suited to applications in which the shaft is soft, or is small in relation to the contact arc of the screw cup. The screw is made of an alloy steel selected for hardness and reportedly offering good capacity for pressure. The screw is available in slotted headless and slotted types only. *Set Screw & Mfg. Co.*

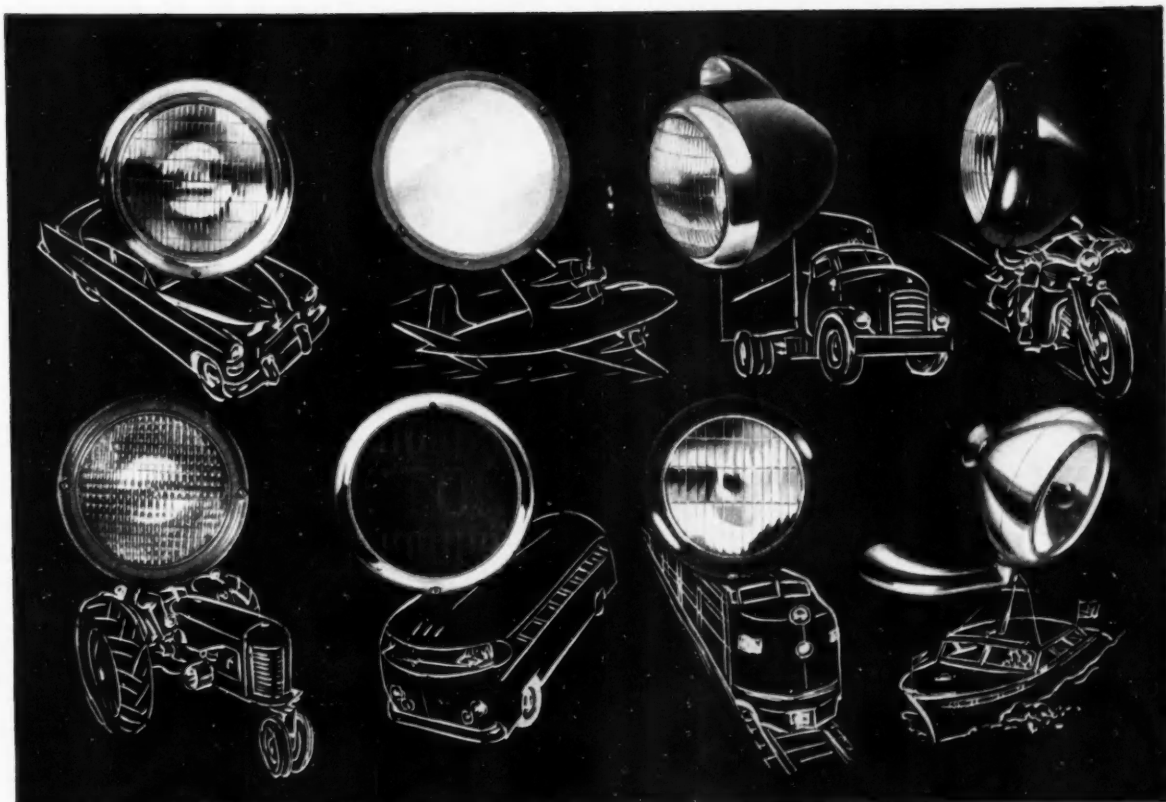
Circle P-9 on page 65 for more data

Silver Brazing Flux

An improved version of 1200 flux compound for use in silver brazing operations has been announced.

Consisting of a mixture of fluoride and borate salts, the flux is said to melt at a temperature lower than the alloys employed and form a coating of used salts over the brazing area. A smooth paste, it is easily removed after brazing by washing with water, the manufacturer states. *The American Platinum Works.*

Circle P-10 on page 65 for more data
(Turn to page 154, please)

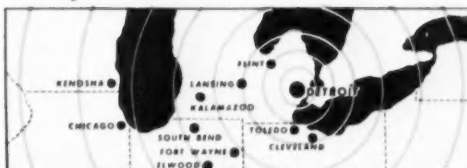


Vision for Transportation

For each of the modern transportation miracles on land, on water and in the air, *vision* plays an important role. Engineers, designers and manufacturers are constantly studying the problems of vision . . . searching for ways it can be improved.

Since 1909, the C. M. HALL LAMP COMPANY has pioneered in America's lighting industry, and has contributed many major light-sight improvements. Today, with our subsidiary, INDIANA DIE CASTINGS, INC.,

we are supplying the many varied needs of civilian and military lighting. In our modern laboratories, we are at work developing better, more efficient lighting . . . striving to improve America's *Vision for Transportation*.



Bright-spot in the Transportation Center!



Vision for Transportation

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Pick a Name

Cessna

Bendix

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Packard

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Sikorsky

A. V. Roe

McDonnell

American

MacDonald

Douglas

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Ryan Aeronautics

Goodyear

Glen Martin

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Solar Aircraft

Chance Vought

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General Electric

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Northrop

Oldsmobile

Beech

Western Electric

Allison

Westinghouse

Hughes

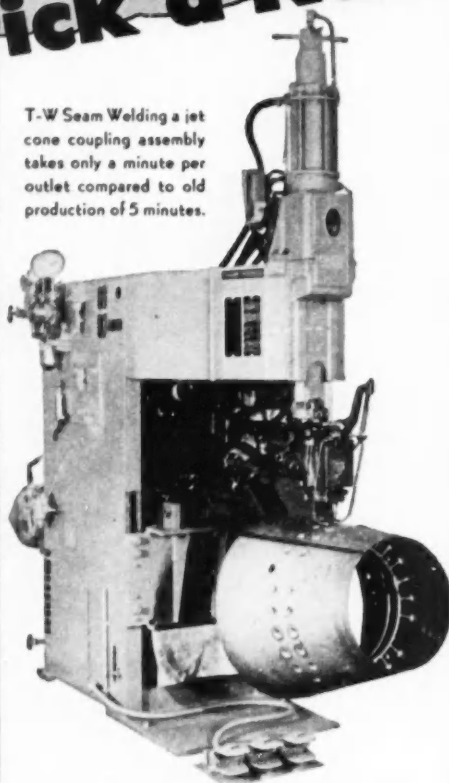
Consolidated

Harrison

United Aircraft

Heintz

T-W Seam Welding a jet cone coupling assembly takes only a minute per outlet compared to old production of 5 minutes.



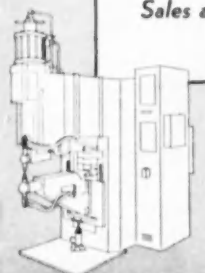
Any one of them uses T-W Resistance Welders to meet Military Specs

● Users of T-W resistance welders have been meeting military specs for some 12 years. When you meet up with the current specifications Mil-W-6860 and 6858 (formerly AN-W-30 and 32), take advantage of this experience. Whether your job is ordnance, aircraft parts, radar, or what have you—you can meet military specifications with T-W welders.

Call on Taylor-Winfield for counsel and assistance on your production. All sizes and styles of resistance welders.

TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

Sales and Service in All Principal Cities



RESISTANCE WELDERS
SINCE 1898



TAYLOR-WINFIELD

RESISTANCE WELDERS

New Products

For additional information please use postage-free reply card on page 65

(Continued from page 152)

High-Temperature Light Lubricant

Recently announced is a lubricant for use at temperatures of 500 F and over. Known as Hi-Temp Oil 303, it is said to be light enough to be fogged easily in automatic lubricators yet provides high load carrying protection.

The lubricant combines molybdenum disulphide with a synthetic base and a pure, low-carbon-content petroleum oil. These properties reportedly impart excellent lubricity, high resistance to heat breakdown, and high stability. *E. F. Houghton & Co.*

Circle P-11 on page 65 for more data

Pneumatic Drill

Said to be constructed for heavy duty operations with maximum power on continuous runs, Model PD-304P pneumatic drill is lightweight and compact in design. The contoured pistol grip, trigger throttle, and built-in speed regulator reportedly combine for easy handling.



The drill has a built-in oiler, and all moving parts glide on precision ball bearings. It measures 6 13/32 in. in length, 2 1/16 in. in width, 6 1/2 in. in height, and weighs only three lb.

The drill comes with a 1/4-in. chuck, key, wrench, hydraulic fitting, 1/4 in. by eight-in. air hose and lubricant. *Mall Tool Co.*

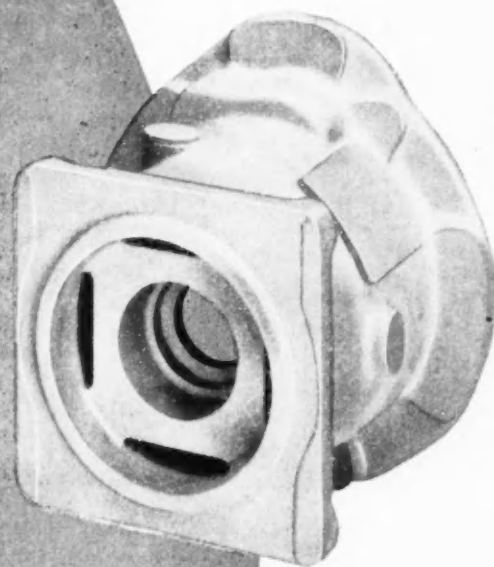
Circle P-12 on page 65 for more data
(Turn to page 156, please)



3 Steps to...

COST SAVINGS with **PERMITE**

ALUMINUM CASTINGS

- 
- 1 Check over those component parts used in your assembly process which might give you a lighter, more efficient, better looking product, or bring you savings in production if cast from light-weight aluminum.
 - 2 Draw upon the experience of Permite engineers who have helped manufacturers in widely varied fields design new parts or redesign old parts to gain full use of the many advantages of aluminum castings. Send us specifications or blueprints covering your parts requirements.
 - 3 Study the recommendations and cost estimates which we will send you to decide whether it might not pay you in production savings and a better or more saleable product to change to Permite aluminum castings — permanent mold, semi-permanent mold or sand mold.

Why not investigate now? There is no obligation.

ALUMINUM INDUSTRIES, INC.
CINCINNATI 25, OHIO

Detroit: 807 New Center Building; New York: 9 Rockefeller Plaza;
Chicago: 64 E. Jackson Boulevard; Atlanta: 413 Grant Building



PERMITE

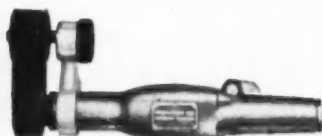
Aluminum Castings

ALUMINUM PERMANENT MOLD and SAND CASTINGS... HARDENED, GROUND and FORGED STEEL PARTS

TWO NEW BUCKEYE Belt Grinding Attachments FOR CLOSE QUARTER WORK

Now—you can save up to 50% on grinding costs, even on close quarter work where every inch of free space counts! These two NEW Buckeye Belt Grinding Attachments are specifically designed for grinding on concave contours and confined areas.

The BGA-12 and BGA-24 models provide the same economy, efficiency and fine finish as the standard BGA-21 and BGA-42 models, PLUS extra maneuverability for working in close quarters. Choose now from four models . . . select the Buckeye BGA that meets your grinding requirements exactly.



BGA-21 2" diameter contact wheel mounted on tool spindle.



BGA-12 2" diameter contact wheel mounted on idler spindle.



BGA-42

4" diameter contact wheel mounted on tool spindle.

BGA-24 2 3/4" diameter contact wheel mounted on idler spindle.

• what are you waiting for?

In just two minutes, you can write for Bulletin S-13 and get complete information on all four models, any one of which can help you cut production time and costs.

Buckeye Tools
CORPORATION

DIVISION 21 • DAYTON 1, OHIO

Portable Air
and Electric Tools
for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario

New Products

For additional information please use postage-free reply card on page 65

(Continued from page 154)

Battery Has Catalyst Caps

Recently marketed is an automobile storage battery fitted with catalyst filler caps to eliminate loss of battery fluid. Such components as Fiberglass separators and multi-plate cells together with the catalyst caps are said to combine to provide a premium battery with high power reserve, dependability, and long life.

Known as Hydrocaps, the battery caps reportedly make the water in the battery last over seven times longer than normal by converting the escaping hydrogen and oxygen gases back into water. They also are said to give an indication of battery overcharge by heating to a point hot to the touch when the battery is receiving a destructive amount of current from the generator.



The caps contain small pellets coated with palladium suspended in a nickel-plated bronze screen cage in the top of the cap. When the escaping hydrogen and oxygen gases reach the pellets, they are recombined by catalysis into two molecules of hydrogen and one of oxygen, and water is formed.

The battery is available with either 51 or 57 heavy-duty plates, and has a 110 or 120 amp hr rating, depending on the make of the car. The case is made of hard rubber to resist road shocks and vibration. *Hester Battery Manufacturing Co.*

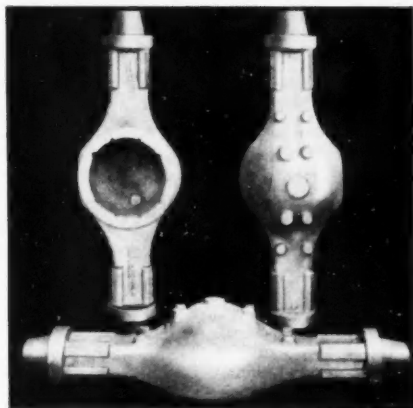
Circle P-13 on page 65 for more data
(Turn to page 158, please)

7000 POUNDS *Extra* PAYLOAD ON *Every* HAUL...



COURTESY PACIFIC FREIGHT LINES

...with Tractor and Trailer Parts of **FRONTIER 40-E Aluminum Alloy**



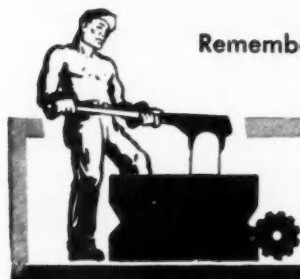
FRONTIER 40-E TRUCK AXLE HOUSINGS

Companies using truck and trailer parts made from FRONTIER 40-E Aluminum Alloy castings are saving **1750 pounds** on the average tractor, **950 pounds** on converter parts and **2300 pounds** on trailer parts. Total weight reductions add up to over **7000 pounds extra payload**! This means increased revenue earned in Freight Ton Mile hauling for those companies taking advantage of the light-weight high-strength qualities of FRONTIER 40-E. You, too, will find 40-E's superior machineability, its shock and corrosion resistance, and its weight-saving features extremely valuable in castings used on your rolling equipment. Get the facts TODAY.

Write Today for your copy of the FREE DATA BOOK and full 40-E details.

Remember... if ALUMINUM can do it better...

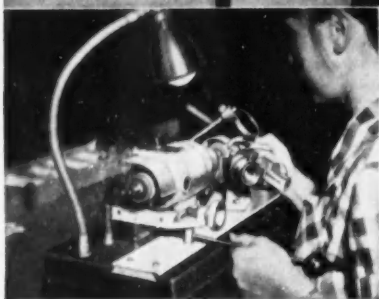
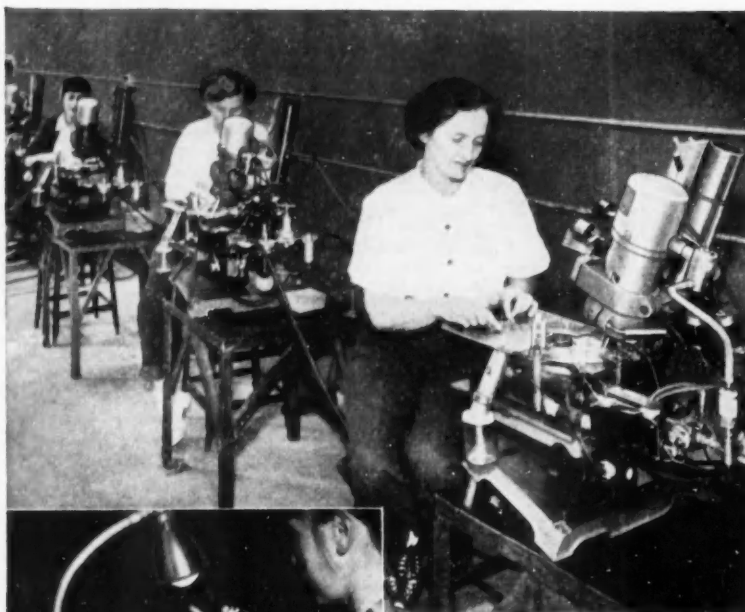
FRONTIER 40-E ALUMINUM ALLOY can do it Best!



FRONTIER BRONZE CORPORATION

4885 PACKARD ROAD, NIAGARA FALLS, NEW YORK

124,800 holes per day! ... using six DUMORE Automatic Drill Heads



Parts are hand loaded in an automatic indexing rotary table with 24 stations. Peak production has reached 23,000 pieces.

A Dumore Precision Drill Grinder is used to sharpen drills after a full day's production. Maximum drill life per grind has reached 23,000 holes.

Get amazing cost-reducing benefits with DUMORE tools

TALK about amazing production! One west-coast manufacturer uses six *continuous running* Dumore Automatic Drill Heads to drill tiny brass parts — at the rate of 20,800 per head per day. The job calls for a No. 71 drill (dia. .026") and hole depth of .069". In addition to the amazingly high production, the user reports that the Dumore Automatic Drill Heads slash costs of drill breakage, down-time and scrap loss.

Amazing, too, are the results this company achieves using a Dumore Precision Drill Grinder to sharpen their drills for this job. They actually get a maximum of up to 23,000 holes per sharpening. That means a full day of continuous production for every Dumore sharpened drill, *without stopping to regrind*.

Get all the information about these tools — their capacity to increase small hole production — to eliminate operator guesswork — to provide completely automatic control. Ask your nearby industrial distributor for a demonstration, or write:



THE DUMORE COMPANY
1339 Seventeenth Street • Racine, Wisconsin

New Products

For additional information please use
postage-free reply card on page 65

(Continued from page 156)

Industrial Glass Fabric

A glass fabric which is said to stretch while the yarns remain stable has been developed. Named Form-Fab, the fabric will primarily be used as a base for reinforced plastics in the low pressure molding of industrial products with compound curves.

According to the manufacturer, no tailoring is required, and the material lends itself excellently to applications where pre-forms are now used. Possible use in such end products as wing tips, radomes, and heating ducts in the aviation industry; and fenders and curved body sections in the automobile industry is foreseen.

Three different constructions of the fabric are now in production. These are in thicknesses of .009 in. and .012 in., both of which come in rolls 250 yards long, and 0.18 in. which comes in rolls 125 yards long. *Industrial Products Div., Hess, Goldsmith & Co.*

Circle P-14 on page 65 for more data

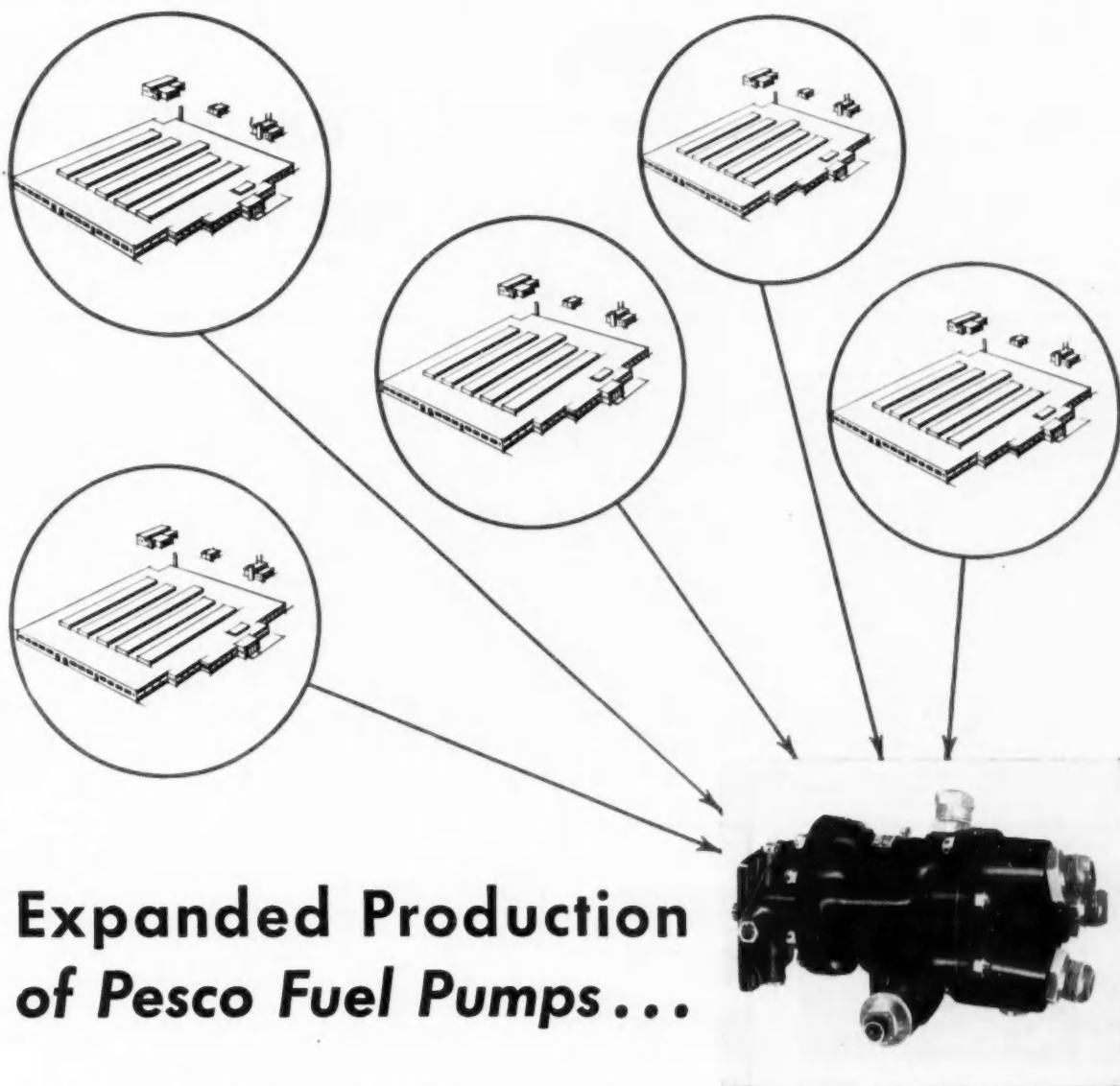
Wire Wheel Disc

Now on the market is a steel disc, incorporating wire spokes, that fits on an automobile wheel in place of a hub cap. A set of the discs is said to give a car the appearance of having attractive wire wheels. The disc is chrome-plated for both appearance and durability. *Gaylord Automotive Div., Gaylord-Shelton, Inc.*

Circle P-15 on page 65 for more data



(Turn to page 162, please)



Expanded Production of Pesco Fuel Pumps...

Today, five factories, in five cities, are devoting all, or part of their manufacturing facilities to building Pesco fuel pumps. The result is a three-fold increase in the production of these vital jet engine and aircraft parts.

In each of these five plants, Pesco's rigid statistical quality control, high standards of precision craftsmanship, and grueling production tests give complete assurance that these Pesco pumps will operate more efficiently and more safely over a longer period of time... will not fail when human lives are depending on them.



Pesco Products Division, Borg-Warner Corporation, 24700 North Miles Road, Bedford, Ohio

SHOP TIPS

New, Free Magnet Idea Kit for Shops



A handy new literature kit showing the hows and whys of permanent magnets is currently sparking shop men to real savings in time, money, effort.

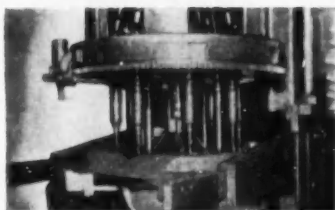
To date, the magnets have proved very effective as sheet steel separators, magnetic stands, tool-holding devices, sweepers' "pickup" tools, paper grippers and tool retrievers, to name a few uses.

Magnet Idea Kit can be obtained free from Carboly Department of General Electric Co. (See address at right.)

★ ★ ★

Drill Cast Iron with Carbide Twist Drills

Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over



H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboly Department of General Electric Co. (See address at right.)

★ ★ ★

New Masonry Drills Won't Stall, Pack



An outstanding advance in rotary drilling of masonry was recently unveiled in Carboly oval-flute "Live-Spiral" Drills.

The drills, tipped with Carboly cemented carbide, won't stall or pack even at very rapid speeds. They work equally well in concrete, brick, plaster, slate or asphalt. For full details write Carboly Department of General Electric Company.


(See address at right.)



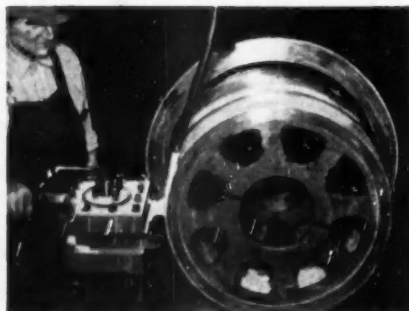
YOUR CARBOLOY FIELD ENGINEER SAYS—

We can help you get swift tool-

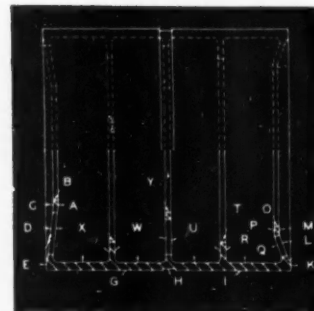
Here's how one leading manufacturer quickly adapts low-cost Standard Carboly Tools to his single-point tool machining operations—jobs that would normally require costly "specials"—and gets them on the jobs in minutes. No special grinding equipment. No delays or heavy inventories. By standardizing on "Standards," he gets full carbide benefits shop-wide—just as you can. Check these pages. Then send me blueprints of your tough single-point tool jobs. We'll show you how easily "Standards" can be best for you, too.



1 Gets 14 "specials" from these 4 styles of "Standards"—A large Midwestern manufacturer (name on request) needed 14 specially shaped tools for a rush job on cast steel gear blanks. From their stocks they selected the 4 Standard Carboly Tool styles shown . . . ground them to the shapes needed in minutes per tool. No long waits for costly "specials," no extra expense or production delays. (See illustrations, below and on right-hand page.)

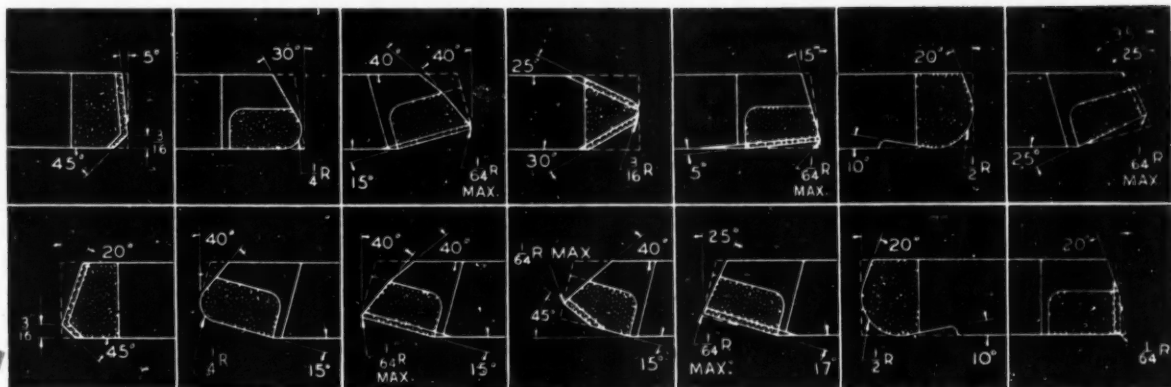


Here is the job—a tough steel casting 26" in dia., 28" wide, and requiring a wide variety of rough and finish turning, facing and boring operations.



Sketch of side view of part showing many of the single-point tool machining operations necessary for the job.

convert to Standard Carboloy Tools and ups, low inventories, lowest tool cost



Dotted lines show the original tip ends of the 4 styles of Standard Tools before they were ground to these 14 special shapes in minutes.

2 Easy for you to use, also—Adapting Standard Carboloy Tools to your special-tool needs is a cinch. They can be rough-ground quickly on ordinary silicon carbide wheels, finished economically on diamond wheels. Standard Carboloy Tools stay sharp up to 10 times as long as high-speed steel tools, last 10 times longer, too.

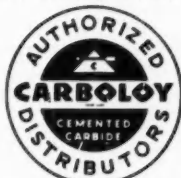
3 You get quicker tool-ups—You'll cut tooling delays to minutes instead of days or weeks with "Standards" on your shelves. Your inventories will be lower—costs, too. Just 11 styles of Standard Carboloy Tools can be adapted to do up to 80% of all your single-point tool machining.

4 You enjoy plant-wide benefits—Let us help you convert to standard styles of Carboloy Tools—for plant-wide benefits. Thousands of shops have done so . . . and now profit from such things as production gains of up to 300%, downtime savings that alone more than pay for the entire cost of the tools.



To get maximum performance from Standard Carboloy Tools, we have the industry's best all-around Carbide Service Program. Includes all types of free how-to-do-it technical data, a tuition-free training school, etc. For details, mail coupon today.

**CARBOLOY
TOOLS
ARE STOCKED
COAST TO
COAST BY**



Look under "Tools" in the Yellow Pages of your local telephone book, or in Thomas' Register, for address and phone number of your nearby Carboloy distributor, branch or district office.

"Carboloy" and "Live-Spiral" are registered trademarks of Carbide Department of General Electric Company

5 Send blueprints of your "specials"—Let us review your single-point tool machining jobs that now require costly special tools . . . show you exactly what "Standards" can be adapted, and how. Send blueprints today to the factory at Detroit, or to your nearest Carboloy District Office. No charge or obligation. See coupon below.

MAIL COUPON TODAY!

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11151 E. 8 Mile Ave., Detroit 32, Michigan

Gentlemen: Please send me, at no cost or obligation, Carbide General Tool Catalog, GT-250.

☐ Also, I am enclosing () blueprints or sketches of the single-point tools we use. Show me, free of charge, which low-cost Standard Carbide Tools can be quickly ground to these special shapes (and how to do it).

Name _____ Position _____

Company Name _____

Address _____

City _____ Zone _____ State _____



SPRAY-STRIP

A MOISTURE AND ABRASION-PROOF PROTECTIVE COATING FOR METALLIC AND OTHER SURFACES



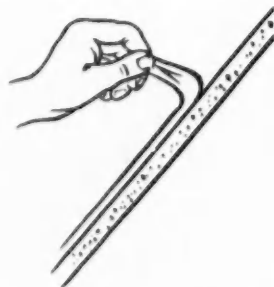
A moisture and abrasion-proof protective coating for metallic parts and surfaces — ideal for packaging tools, gears, bearings, instruments and parts while in process, transit or storage.

SPRAY-STRIP is resistant to salt water, moisture, oils, grease, mildew and alkalis. It will not support combustion after application, and will remain flexible at low temperatures.

STRIPS OFF

Fast drying, Spray-Strip forms a smooth, tough skin which protects surfaces against damage caused by moisture, scratches and abrasion. May be peeled away in large sections or a single sheet depending upon thickness of application.

May also be used to coat walls of storage and curing rooms to aid humidity control and for spray booths and other surfaces subject to soil.



**Technical data
on request**

EAGLE CHEMICAL COMPANY
146 INDUSTRY AVE., JOLIET, ILLINOIS

New Products

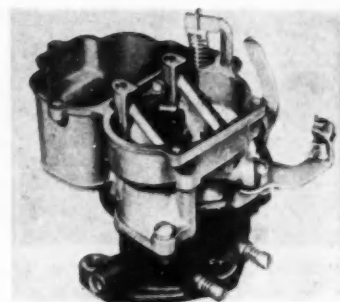
For additional information please use
postage-free reply card on page 65

(Continued from page 158)

Ford Carburetor

According to a recent announcement, Model 2100 carburetor, now original equipment on all eight-cyl 1952 Ford cars and trucks, has been approved as the replacement carburetor for all Ford eight-cyl cars and trucks as far back as 1932.

Model 2100 is said to have important new design and engineering



changes. High lift nozzle bars increase engine performance at extreme angles and eliminate percolation or "vapor-lock." Stalling during fast starts and stops is also eliminated, according to the manufacturer, **Holley Carburetor Co.**

Circle P-16 on page 65 for more data

Diesel Line

Now available are three Diesel engines equipped with turbo-superchargers for increased power. See Page 43 of this issue, **Waukesha Motor Co.**

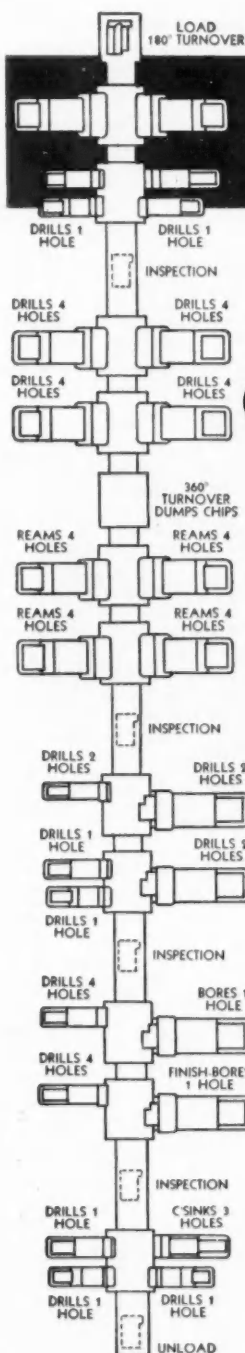
Circle P-17 on page 65 for more data

Radiator Hose

Recently developed is a heavy-duty, flexible radiator hose for use on trucks, buses, and tractors in either arctic or desert temperatures.

Known as the Straight-Flex H.D., the hose reportedly will not soften under extreme heat or harden in sub-zero weather and is not affected by oils, greases or chemicals. **Dayton Rubber Co.**

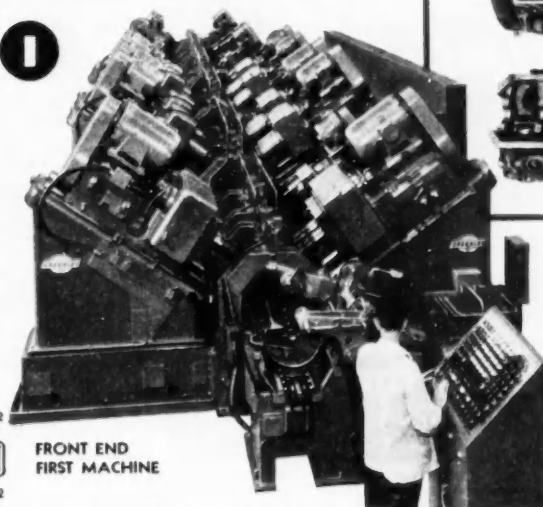
Circle P-18 on page 65 for more data
(Turn to page 164, please)



GREENLEE

TRANSFER MACHINES

1



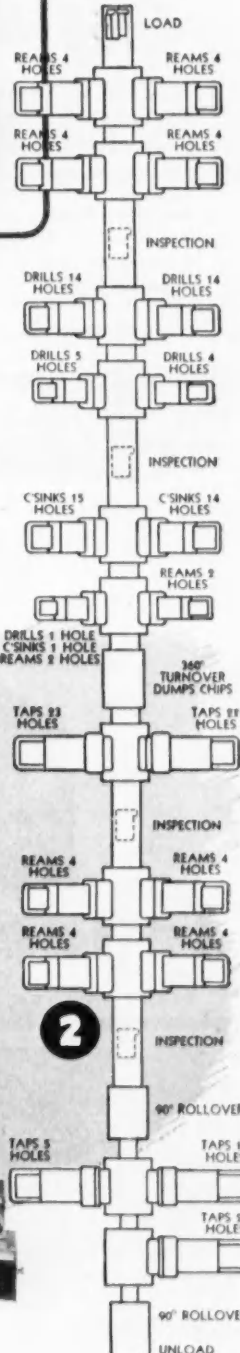
FRONT END
FIRST MACHINE

PERFORM 289 OPERATIONS ON V-8 CYLINDER BLOCKS AT 75 BLOCKS PER HOUR

New tooling for a brand new V-8 motor includes three lines of Greenlee Automatic Transfer Machines similar to the units illustrated. Each 2-machine line performs 289 operations on cylinder blocks during a 45-second cycle.

Sound construction, proved engineering, and a background of experience in building special machinery that dates back to 1918 assure you profitable, trouble-free operation.

NEW V-8 BLOCKS



2

REAR END
SECOND MACHINE

GREENLEE BROS. & CO.
1752 Mason Ave., Rockford, Illinois



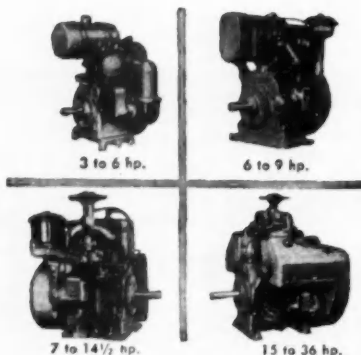
**Most Specified...
Most Used...
Most H.P. Hours...
WISCONSIN
HEAVY-DUTY
Air-Cooled
ENGINES**

Specified as integral power units by more than 500 original equipment manufacturers...

Delivering dependable, efficient power on a greater variety of service applications than all other makes of engines combined, in a 3 to 36 hp. range...

Supplying Most H.P. Hours of heavy-duty on-the-job power in all weather, all climates...

Constantly demonstrating the outstanding



efficiency and trouble-free dependability of AIR-COOLING...

These are some of the factors worth considering in the selection of engine power for YOUR equipment. Detailed engineering data and descriptive literature on request.



WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

A 7433-1/4

ROLLERS FOR BEARINGS
SPRING PLATES
CAD SCREWS
PINIONS
BOLTS-NUTS
RIVETS
WRENCH PARTS
VALVE SPRINGS
DIFFERENTIAL GEARS
TRANSMISSION GEARS
CHAIN SPROCKETS
SPRING CLIPS
SMALL TOOLS
ROCK BITS
FORGINGS

ROLLER BEARINGS
TRACTOR LINKS
AIRCRAFT PARTS
WASHERS
ENGINE PARTS
COIL SPRINGS

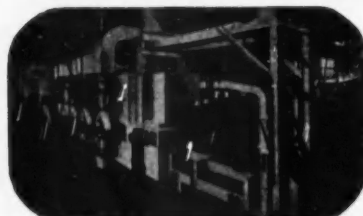
ELECTRIC FURNACES
FUEL FIRED

For Hardening Small Parts
Uniformly—Scale Free—Continuously
175 to 2000 Lbs. per Hr.

The EF chain belt conveyor furnace is one of the most satisfactory continuous heating units yet devised for scale-free hardening, carbon restoration and non-decarb heat treating small and medium size parts. In standard sizes. Capacities to 2000 lbs. or more per hour. Gas, oil or electrically heated. Furnished complete with any desired feeding or discharging equipment. Write for folders describing our chain belt or other production furnaces.

THE ELECTRIC FURNACE CO.
WILSON STREET, SALEM, OHIO

Gas Fired, Oil Fired and Electric Furnaces
Canadian Associates * CANEFECO LIMITED * Toronto 1, Canada



EF Chain Belt Conveyor Furnace, Radiant Tube Gas Heated, Showing Labor Saving Loading Arrangement. (In the view at the top) Electrically Heated Furnace Showing Automatic Quench and Discharge.

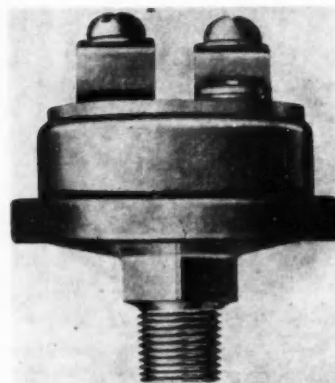
New Products

For additional information please use postage-free reply card on page 65

(Continued from page 162)

Pressure Switch

Recently announced is an improved pressure switch, which is designed especially for use in connection with a line of hour meters, but which can be adapted to other uses.



Heavier materials are used for the terminals to give a more rugged construction and permit these parts to be more securely assembled to the switch. The operating diaphragm is now assembled without the use of solder to assure positive and proper functioning. The use of solder in the final assembly is also eliminated and the new construction makes oil leakage impossible, according to the manufacturer.

The ability of the switch to withstand the action of heat and cold, as well as the accuracy of operation, has reportedly been greatly improved by means of equalizing the pressure in the inside upper chamber with that on the outside of the switch. *John W. Hobbs Corp.*

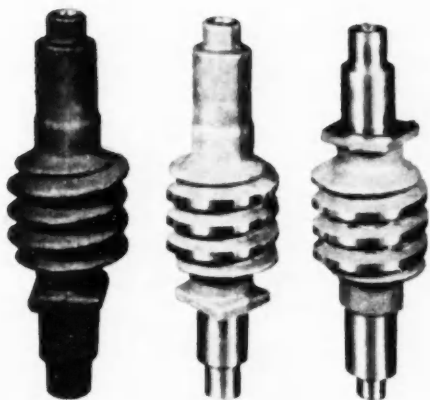
Circle P-19 on page 65 for more data

Traveling Crane

Recently introduced is a 1/2 ton Mobilcrane featuring a low boom and narrow platform. It is said to lift and move up to 1000 lb and operate easily in close quarters.

The crane has a lift height of six ft and features a single-unit hydraulic pump without hoses and outside couplings. *Lempco Products, Inc.*

Circle P-20 on page 65 for more data
(Turn to page 166, please)



THIS EARLY BIRD GETS THREE TIMES THE WORMS!

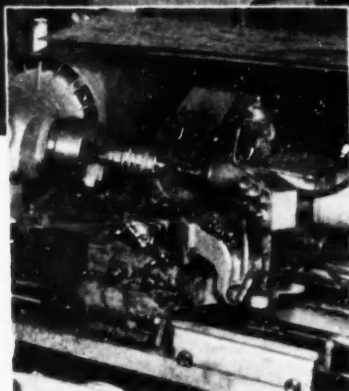
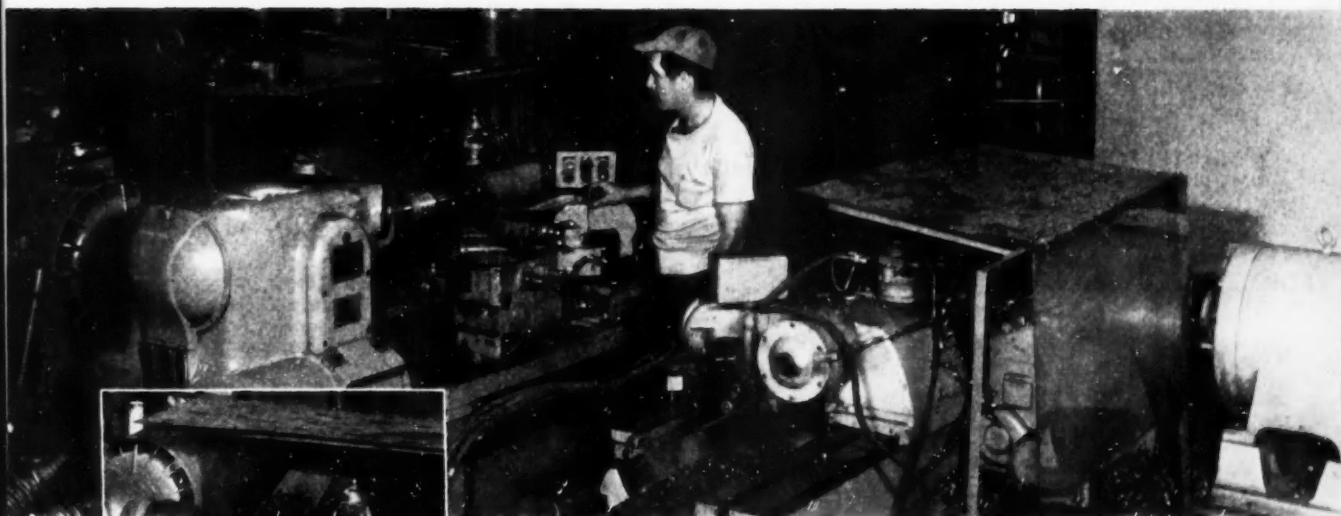
That's the Mona-Matic for you!

"THREE TIMES THE OUTPUT!", says Gar Wood Industries, Inc., of their new Mona-Matic installation. Output has increased, on turning these worm shafts, from 2 pieces formerly put on the floor every 14 minutes, 45 seconds to 2 pieces every 4 minutes, 9 seconds—one man operating two machines in each case. That's more than a 255% production increase for the Mona-Matics!

There's a great performance story here, too. Only a machine built like the Mona-Matic can deliver satisfactory finish and good tool life while maintaining required limits on the intermittent cut over the forged

worm threads. The 2-speed motor on Machine #1 easily accommodates the turning of diameters as varied as those of worm threads and shaft end. Excessive stock removal from small end diameter is accomplished by dual template control on Machine #2. With two tools on rear slide of each machine, one faces the end of the shaft while one rough faces a shoulder and forms an undercut.

Here's a machine that can boost output and cut costs on long runs and short ones. Why not find out—right now—what it can do for you? Write for Booklet 1805 containing full information, data, job reports. It's new! . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

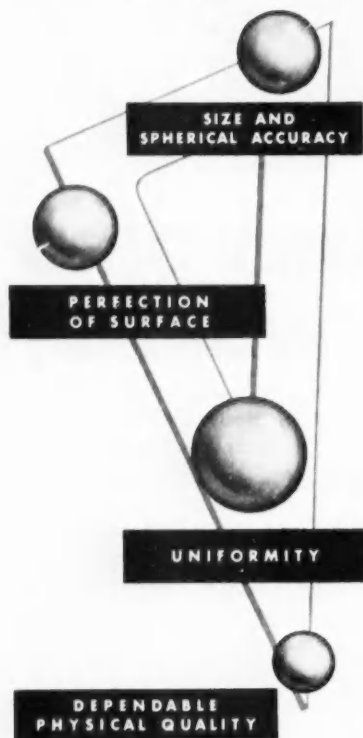


Part—Worm Shaft. **Material**—SAE 8640 forging. **Operation**—turn complete for grind using carbide tools. Limits $\pm .001$ ". **Comment**—with one operator for two machines in each case, output has soared from 2 pieces every 14 minutes, 45 seconds to 2 pieces every 4 minutes, 9 seconds—a 72% reduction in machining!

Monarch
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

from any angle



STROM *is your* BEST BALL BUY

If you have a metal ball problem, why not let Strom solve it for you. Whether for precision ball bearings or for one of many other ball applications... Strom will supply the *right* ball to meet your requirements. For more than a quarter century, industry has looked to Strom for metal balls of unsurpassed quality.

Strom
STEEL BALL CO.

Largest Independent and Exclusive
Metal Ball Manufacturer
1830 So. 24th Ave., Cicero 30, Ill.

New Products

For additional information please use
postage-free reply card on page 65

(Continued from page 164)

Hard Rubber Compound

Recently developed is a synthetic hard rubber compound for sustained high-temperature applications in handling many corrosive solutions.

Known as Ace Tempron, the compound is now available in four forms: pipe and fittings; molded parts; sheet, rod, and tubes; and a hand-fabricating process for making tanks, large fittings, etc., by forming sheets of the compound around cores or mandrels while still in the soft state prior to vulcanization.

The material is said to have high tensile strength (7500 psi), while heat distortion temperature is 260 to 275 F. Excellent dielectric properties suggest applications in electrical parts operating at high temperatures, according to the manufacturer. *American Hard Rubber Co.*

Circle P-21 on page 65 for more data

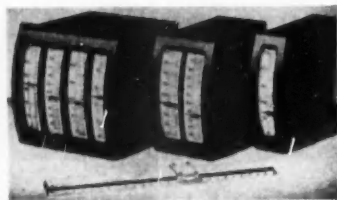
Supercharged Diesel

Recently announced is a six-cyl supercharged Diesel, known as the 6-DAS-516, for heavy-duty trucks. See Page 54 of this issue. *Buda Co.*

Circle P-22 on page 65 for more data

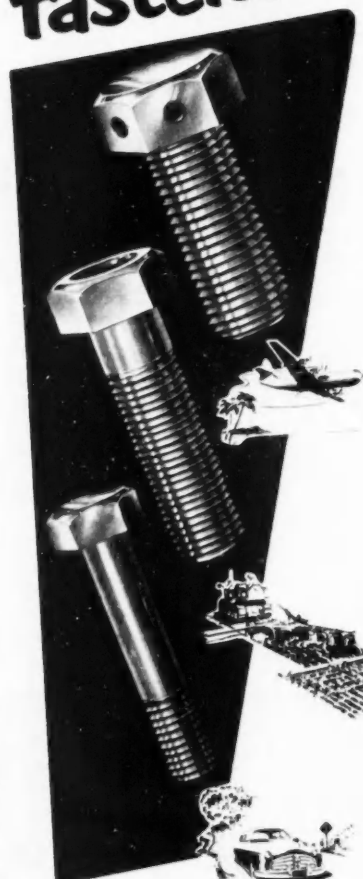
Indicating Instruments

Now available is a series of vertical scale indicating instruments. Known as Mindicators, the multi-purpose gages are used on graphic or process control panel boards as receivers and as reading gages and thermometers.



The instruments are said to be unique in their interchangeability of all parts and complete assemblies. All units have a four-in. scale, although a panel opening of only 5 3/8 in. by 1 1/2 in. (Turn to page 170, please)

cold forged metal fasteners



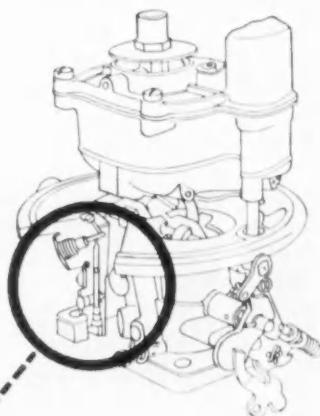
● For (✓) high quality material, (✓) precise machining, (✓) fast assembly, and (✓) good appearance, specify CHANDLER cold forged metal fasteners. They are manufactured from tested high quality alloy steel by the most modern machinery and methods. Every fastener must pass rigid inspection to make sure it meets your specifications. This uniform high quality makes assembly faster, and smoothly finished heads assure good appearance of the completed assemblies.

Specialists in Alloy Bolts... Grinding to close tolerances... Drilled heads or shanks. Diameters 1/4" 5/16" 3/8" to 3" in length and diameters 7/16" 1/2" 9/16" to 5" in length.

981 CH

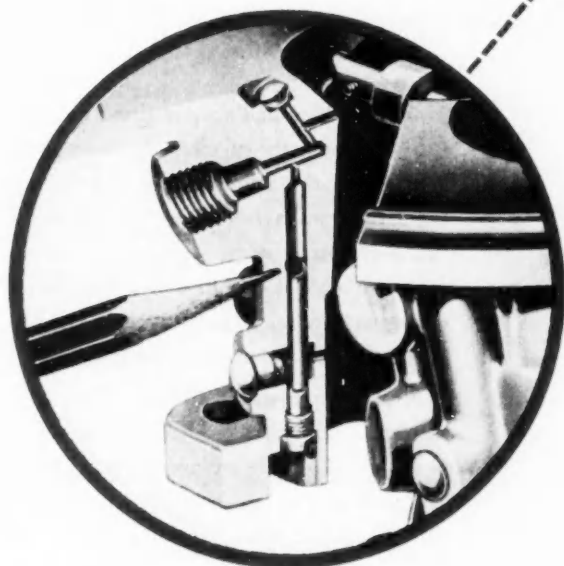
Manufacturers of Place Self Locking Bolts

Chandler Products Corp.
1492 Chardon Road • Cleveland 17, Ohio



DU PONT NYLON *improves carburetor performance*

*Lightweight distributor-
passage ball is tough,
resilient, non-corrosive*



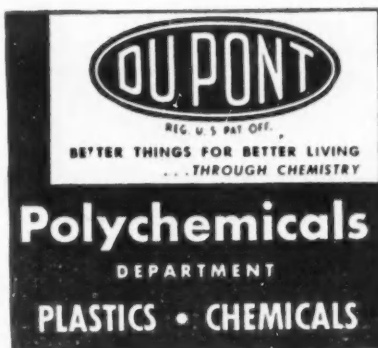
Distributor passage balls made of Du Pont nylon by Ace Plastic Co., Jamaica, L. I., N. Y. for Holley Carburetor Co., Detroit.

Engine "ping" is often experienced in automotive engines during periods of rapid acceleration. Engineers of the Holley Carburetor Company have designed an automatic spark control to overcome this condition. The control unit's action is initiated by a ball check valve in an air passage in the carburetor body. It is actuated by pressure differential between the venturi and manifold. To achieve the desired sensitivity of control, the ball material had to be lightweight, yet resistant to corrosion, gasoline and oil fumes, abrasion and impact.

Such a material was found—Du Pont nylon plastic. Du Pont nylon has a specific gravity of 1.14. It is unaffected by electrolytic corrosion, oil fumes and moisture. Nylon is tough, even at low temperatures . . . resists abrasion and impact . . . can be used continuously at temperatures up to 250°F. It is resilient . . . absorbs shock without chipping or denting . . . makes an excellent valve-seat material.

The lighter nylon balls instantly react to pressure differentials. Distributor vacuum is maintained. The control unit retards the spark during acceleration. Carburetor performance is increased, and engine "ping" is reduced.

Du Pont nylon is improving performance and cutting costs in many automotive parts—such as clutch- and brake-bumper seals, windshield-wiper gears, and lamp lenses. Perhaps Du Pont nylon can help you improve or develop a product. For further information, write:



E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department; District Offices:
350 Fifth Avenue, New York 1, New York
7 S. Dearborn St., Chicago 3, Illinois
845 E. 60th St., Los Angeles 1, California

ANNOUNCING!

NATIONAL



**National, a world leader
in oil seals, now offers a
complete line of O-Rings**

You know National's reputation as a leading manufacturer of oil seals. Now, you can expect the same quality of product, the same good service on O-Rings. With the new distribution system now being set up, National O-Rings will be offered through a wide-spread network of applications engineers and distributors.

National pioneered O-Rings two decades ago through a subsidiary organization. Now, with O-Rings an integral part of our line, we will be able to provide better engineering service, better sales service, consistent quality and uniformity, and the convenience of a common source for oil seals, O-Rings and shims.

NATIONAL O-RING CATALOG

The most broadly useful compilation of O-Ring data. Includes engineering, design and compound information, gland-groove and back-up ring requirements, etc. Lists all National O-Rings. Please request free copy on your Company letterhead, giving your title.



NEW

Write for Catalog!

O-RINGS

National O-Rings are molded to precise tolerances from a variety of compounds. They are available for dynamic or static applications in all standard sizes, covering a wide range of pressures and temperatures.

Why not see what National has to offer. Our new catalog contains full information.

USE OF O-RINGS IS BROAD

In many applications, O-Rings offer important advantages over conventional gaskets or packings:

- May permit simpler, lower-cost design
- Effective in limited space, easy to install
- Seal both directions of pressure flow
- Withstand wide range of temperatures
- Permit metal-to-metal joints
- Hold running friction to minimum
- May eliminate adjustment devices
- Efficient sealing under varying pressures

*T. M. Reg.

NATIONAL OIL SEALS AND SHIMS

National Oil and Grease Seals are available in thousands of sizes and types for almost every kind of sealing application involving rotating, oscillating or reciprocating shafts. These precision-built seals are offered with sealing members of specially-processed leather, synthetic rubber (Syntech* Seals) or silicone rubber.

National Shims are assemblies of individual laminations of uniform thickness. (.002" and greater)



50,000 series
leather seal



350,000 series
Syntech seal



50,000-5 series
Syntech seal

"Let Your Decision be Based on Precision"



NATIONAL MOTOR BEARING CO., INC.

General Offices: Redwood City, California
Plants: Redwood City, California; Downey (Los Angeles County), California; Van Wert, Ohio

2860



.. or Released in an Instant



Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts never work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study your fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.



GREER Stop Nuts

New Products

For additional information please use
postage-free reply card on page 65

(Continued from page 166)

in. for single units and 1 3/4 in. additional width for each unit added to a multiple housing is required.

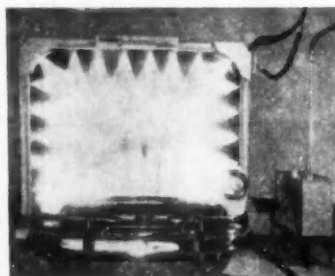
Units designed as receivers operate on transmitted pressure of 3 to 15 psig, using calibrated metallic bellows measuring elements. Direct-reading thermometers are available in scale ranges from -200 F to 1000 F.

Pressure gages are available in scale arrangements from a low of 0 to 10 psig to 0 to 1000 psig. The Dickson Co.

Circle P-23 on page 65 for more data

Automotive Washers

Announced recently is a line of automotive washers, of which three models are said to be designed primarily to wash passenger cars. All models, except one, are reportedly fully automatic.



The larger washers include one for panel trucks and other small commercial vehicles as well as passenger cars. Another is for small and medium-size commercial vehicles, while a third will wash large trucks, trailers, and buses. Jetomatic, Inc.

Circle P-24 on page 65 for more data

Winter Tire

Now available with either white or black sidewalls is a low-pressure tire designed for all kinds of winter road conditions. It is said to have a special non-skid tread for good gripping action in snow, ice, or mud.

The continuous tread design formed by the interlocking non-skid bars eliminates vibration, rumble, and whine. Firestone Tire & Rubber Co.

Circle P-25 on page 65 for more data

COLD HEADED—
ROLL THREADED

PHEOLL

SPECIAL
FASTENERS
and SMALL PARTS
are BETTER

BECAUSE YOU GET

A greater variety of fasteners and small parts that can be made faster, stronger and more economically by Pheoll's cold heading and roll threading methods. Cold working of wire stock often surpasses turning, casting, stamping, drawing or molding.

LOWER MATERIAL COST . . . Cold-heading results in much less scrap than in metal cutting operations, in fact in the production of most cold-headed parts there is little or no scrap.

LOWER PRODUCTION COST . . . due to high production rate. Cold heading . . . entirely automatic, is not affected by operator skill, strength or fatigue.

LOWER DIE COST . . . Cold-heading dies cost less, even on more intricate sections, than for any other forming operations.

INCREASED TENSILE STRENGTH . . . Improved physical properties are imparted to all metallic fasteners by cold working.

GREATER TOUGHNESS and FATIGUE RESISTANCE . . . because grain flow of material is compacted and directed to follow contour of piece.

UNIFORMLY HIGH QUALITY PARTS . . . assured because cold working requires materials free from structural defects.

Single or multiple secondary operations can be performed on cold headed parts to produce special characteristics required to fit the part for its particular application. Such operations include drilling, tapping, milling, shaving, flattening, notching, flanging, trimming, bending, off-setting, slotting, fluting, swaging, knurling, pointing, heat treating, plating and finishing—all in Pheoll's modern plant.

PHEOLL PROFIT PRODUCING FASTENERS

Machine Screws	Thread Cutting Screws
Phillips Recessed	Tapping Screws
Head Screws	Cap Screws
Sems	Threaded Rods

PHEOLL

MANUFACTURING COMPANY
5700 Roosevelt Road, Chicago 30, Ill.



SCREWS
BOLTS
NUTS

there's more to rubber than

Stretch



The most important factor about any rubber part is its ability to do the job for which it is intended. While the slingshot requires stretch only, industrial rubber parts must have resistance to oils, chemicals, weather, temperature extremes or combinations of these deteriorating factors.

STALWART engineers have the experience and facilities to compound stocks and fabricate rubber parts which will serve your needs best. From more than 500 different rubber stocks at their disposal they can mold, extrude, die-cut, lathe-cut or mandrel-build shapes to meet individual, S.A.E. or A.S.T.M. specifications. These parts will retain their desirable physical, chemical and dielectric properties under severe operating conditions and give optimum performance in each application.

Specify STALWART rubber parts for that one essential quality . . . the ability to do a job . . . best.

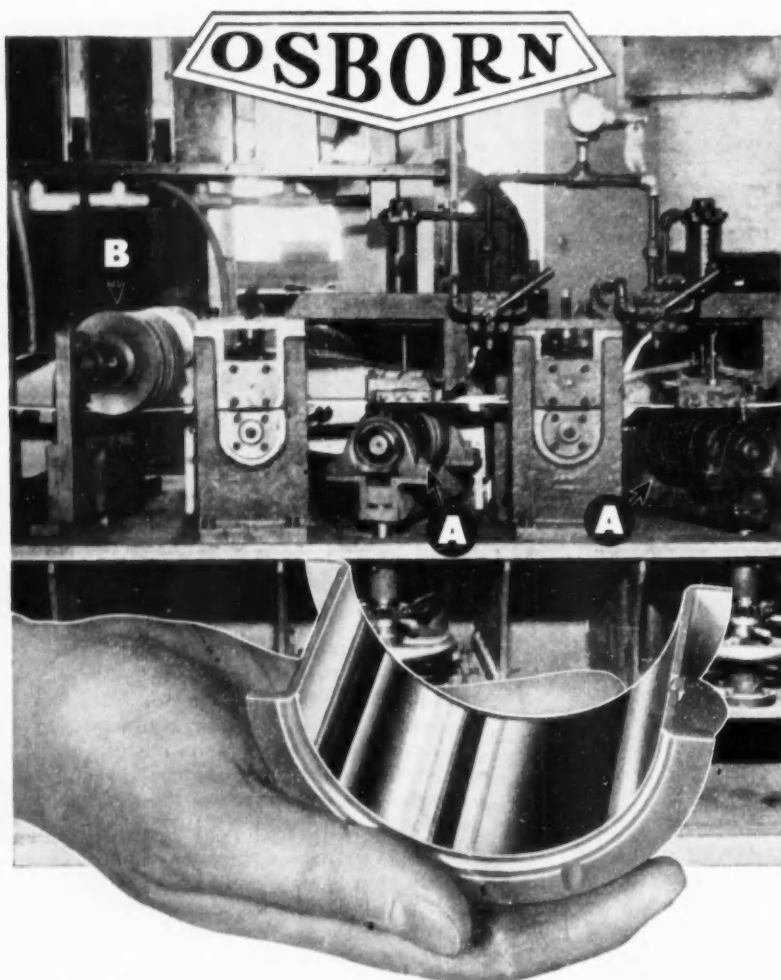
1058-388



Write today for
Catalog 51SR-1
for complete
information.

STALWART RUBBER COMPANY

200 Northfield Road • Bedford, Ohio



Will "automatic" ideas like these cut your costs?

THIS machine does two jobs at one time . . . does them thoroughly by power brushing . . . at the push of a button.

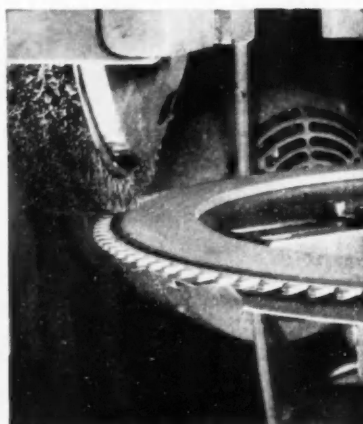
Perhaps a similar brushing method can help cut *your* costs, boost *your* production and improve the quality of *your* products.

The machine developed with the help of the **Osborn Brushing Analyst** cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch, Sections (B) then thoroughly clean the babbitt side.

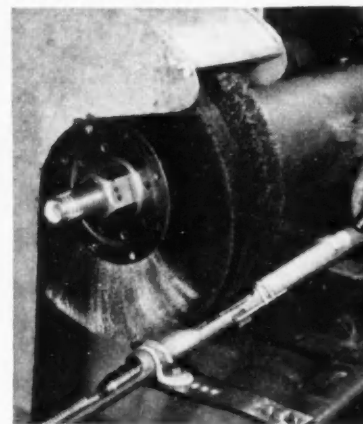
This is typical of the cooperation which your **Osborn Brushing Analyst** can give *you* to solve problems of product cleaning, burr removal, roughing, polishing and finishing. For help, call or write *The Osborn Manufacturing Company, Dept. E-2, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes®

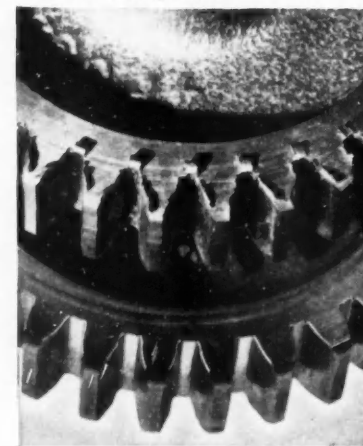
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



SAVES 12 MEN. This is one station of a five-station rotary automatic machine equipped with Osborn power brushes that removes burrs and sharp corners of clutch disc teeth. Formerly done by hand. Saves 12 skilled men.



9 TIMES AS FAST. This simple pipe fixture provides the means of cleaning threads of set screws. Can be applied to many cylindrical parts. Time was cut from 18 seconds to 2 seconds with this Osborn brushing idea.



10 TIMES AS FAST. This shows two gears before and after deburring by a new Osborn power brushing method. Note smooth uniform results. Time was cut from 3 minutes to 18 seconds.

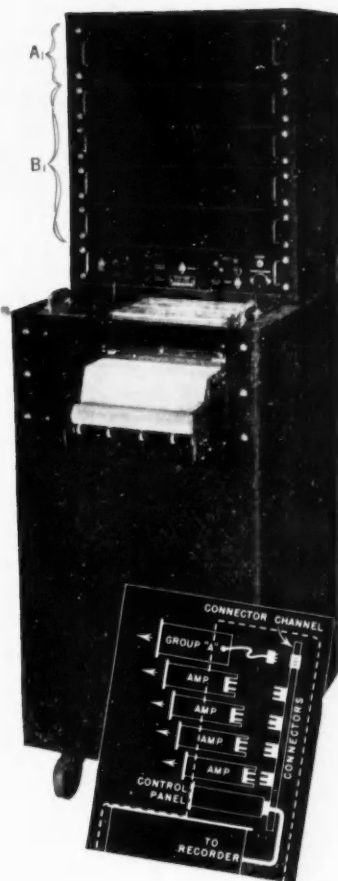
It's **VERSATILITY** that sells **SANBORN** in the field of **Industrial Recording**

As indicated by references at the right, you may have a choice of five different instruments (A) for quick and convenient standard rack mounting in the system at A₁, **PLUS** a choice of up to four of any of the three different type amplifiers (B) or any combination of these amplifiers

with the

SANBORN FOUR-CHANNEL OSCILLOGRAPH RECORDING SYSTEM

(MODEL 67)



As shown in the diagram, removing or interchanging any of the amplifiers or other instruments is simply a matter of sliding the unit in or out of the mounting rack where contact is made automatically by plug-in connectors. Screws at the four corners of the panel hold the instrument in place.

Other features of this system which add to Sanborn **VERSATILITY** are the choice of eight paper speeds—50, 25, 10, 5, 2.5, 1.0, 0.5 and 0.25 mm/sec, and the use of either 4-, 2-, or 1-channel recording paper.

And, of course there are these popular Sanborn advantages: a high torque movement (200,000 dyne cms per cm deflection), direct **inkless** recording in **true rectangular coordinates**, and provision for code and time markings.

Sanborn Recording Systems may be used to record any one or more of a wide variety of phenomena whose characteristics range from static to 100 cycles per second. If your recording problem is not one which can be solved by standard Sanborn equipment, our engineers will be glad to suggest ways in which modifications of it may suit your requirements.

A complete catalog of Sanborn Industrial Recording Equipment will be sent gladly on your request.

SANBORN COMPANY

CAMBRIDGE 39, MASS.



DC PREAMPLIFIER



AC PREAMPLIFIER



DC CONVERTER—for low level DC recording such as thermocouple output.



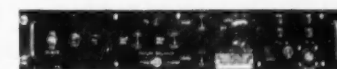
TRIPLEXER—when coupled to a DC amplifier permits the recording of three events in one channel.



THRESHOLD MONITOR provides means for the control of voltage levels or rate of change.



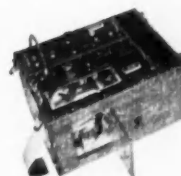
DC (General Purpose) AMPLIFIER



STRAIN GAGE (Carrier) AMPLIFIER



SERVO MONITOR AMPLIFIER—a phase discriminating AC amplifier used in servo design and testing.



One channel Model 128/141 above and two-channel Model 60 at right both incorporate Sanborn recording advantages which include interchangeability of amplifiers and (with Model 60) preamplifiers.

SANBORN 1-, AND 2-CHANNEL RECORDING SYSTEMS



"That

PUNT

certainly proves

any assembly problem can be licked!"

Mike continued, "What my company* found out making football shoes can help any manufacturer get better, more economical production. I'd say that includes your refrigerators, Tom."

"How come?" said Tom.

"I never thought any screw would be just right for holding cleats to my football shoes. That's before the RB&W man came to my plant, and persuaded me to let RB&W try to develop one for me. Now I'm using RB&W screws that are ductile enough to go along with the impact, yet tough enough not to break. It just proves we should all pay closer attention to our fasteners. It really pays off!"

There's a cost-cutting lesson for you in this Rose Bowl conversation, whatever your industry. So look to your fasteners for an often overlooked opportunity to reduce costs, and strengthen your competitive position. New inventions, like RB&W's SPIN-LOCK Screw, may prove more efficient than the fasteners you're now using.** Or you may save by the stepped-up production you get from using the finest fasteners . . . RB&W bolts, screws, nuts and rivets of uniform accuracy, dependability and physical properties.

Let RB&W help you make the most efficient use of fasteners on your assembly line. Address RB&W at Port Chester.

RB&W—The Complete Quality Line. Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents: Portland, Seattle. Distributors from coast to coast.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

RB & W

100 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

*Brooks Shoe Manufacturing Co., Philadelphia, Pa.

**New SPIN-LOCK Catalog is in the Product Design File. Write for extra copies.

The U. S. Steel Supply team that gives you *personalized service*



...our salesman
puts this team to work for you!

SUPPLYING YOUR STEEL requirements becomes our team objective when you tell your needs to your U. S. Steel Supply salesman. Behind your salesman is a team of technical experts, each one a specialist in his field . . . and your business receives the attention of every member of the team who can contribute to its progress.

What do you need? Steel? Tools? Special purpose equipment or machinery? Advice on working an unfamiliar type of steel? Help in meeting a pressing delivery date? Give your order to your U. S. Steel Supply salesman. He will see that it gets immediate attention from the U. S. Steel Supply specialists best qualified to serve you.

YOUR "ONE CALL" SOURCE OF STEEL SERVICE

U.S. STEEL SUPPLY



UNITED STATES STEEL SUPPLY DIVISION, UNITED STATES STEEL CORPORATION

HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL.

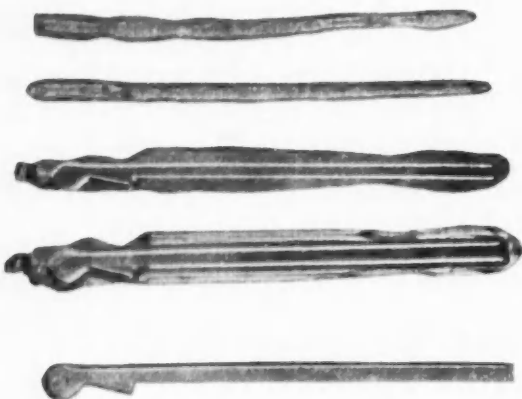
WAREHOUSES AND SALES OFFICES:

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UNITED STATES STEEL

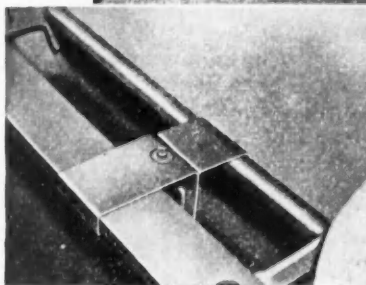
CECO-DROP SHORT STROKE CONTROL

"Makes the Hammer Talk!"



An installation of a Short Stroke Control on a 2500 lb. CHAMBERSBURG CECO-DROP HAMMER is shown, forging steel ankle joints for leg braces. Above are samples of the forging as it appears during various stages. The forging process begins with a series of 20 to 23 short, rapid blows (about 18" stroke) to draw the $\frac{3}{4}$ " dia. stock. This is followed by two long blows (about 35" stroke) to roll it, three more long blows in the rough impression, and three more long blows to complete the forging. After the last blow the ram is stopped on the up-stroke at the "short blow" position for the next forging.

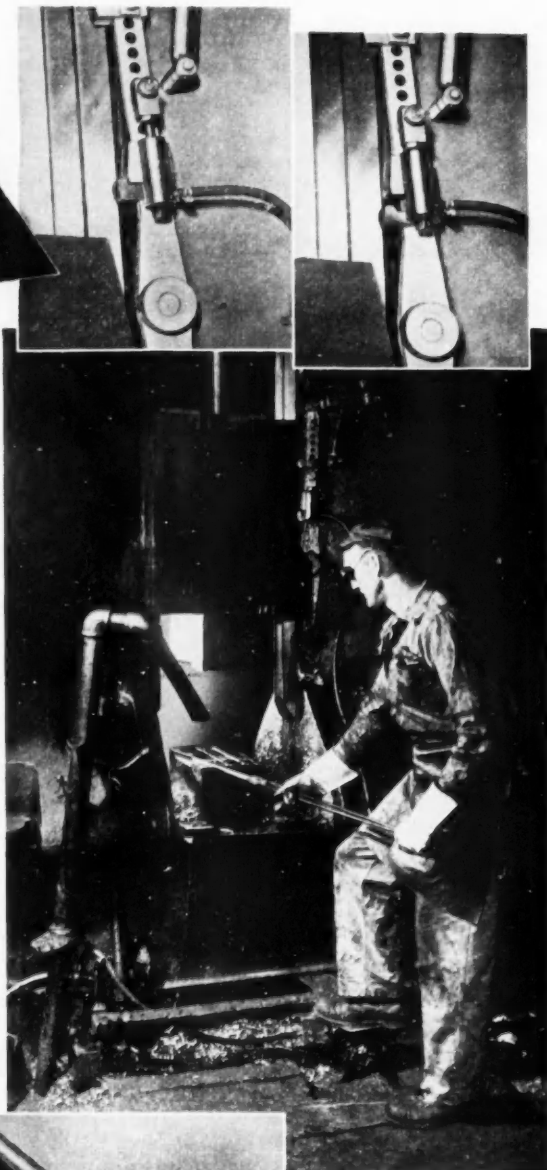
Short Stroke Control is but one of the many features of Chambersburg CECO-DROPS. These piston lift, gravity drop hammers are setting new standards in forge shop production. Lower operating costs, minimum down time, easy operation, wide range of operations, extra safety; all add up to "more forging per hour" the basis on which to judge the efficiency of a Drop Hammer. Write for Bulletin 11-L-O.



(Above right) Dog in full stroke Position. Wedge is lifted, Short Stroke Control is inoperative.

(Above left) Dog in Short Stroke Position. Wedge is down, holding dog in operating position.

(Lower left) Button on treadle when depressed by operator shortens the stroke. Release reverts to full stroke.



CHAMBERSBURG ENGINEERING COMPANY, CHAMBERSBURG, PA.

CHAMBERSBURG

THE HAMMER BUILDERS



*Our Engine Bearings
are specified as
original equipment
by the leading
names in motordom
because they have
consistently
contributed to better
performance
for more than a
quarter century.*



MERCURY

Ford

Nash

DODGE

DeSoto

FALK

Willys



Chrysler

Mack

Studebaker

Continental

INTERNATIONAL



CASE

HERCULES

DETROIT ALUMINUM & BRASS CORPORATION
DETROIT 11, MICHIGAN



For specification hardening—for carburizing and gas cyaniding small loads—The Vapocarb-Hump equipment is widely used.



For scale-free steam atmosphere heat treating—for economical air atmosphere tempering—progressive heat-treats use the Steam Homo.

USE THIS FURNACE "TEAM" FOR *More Heat-Treating Versatility... in less floor space!*

● More and more heat treaters are discovering the versatile Vapocarb-Hump and Steam Homo furnace team . . . are finding just how useful this combination can be. For these two furnaces can handle well over 90% of the heat-treat requirements of most toolrooms and small heat-treat departments. In addition, this team offers a variety of furnace atmospheres . . . permits greater flexibility in choosing the right heat treatment for a particular job . . . saves floor space by eliminating the need for infrequently used special purpose furnace equipment.

THE VAPOCARB-HUMP FURNACE The Vapocarb-Hump method of hardening with Triple Control—control over atmosphere, rate of heating and quench point—gives the heat treater the precise controllability necessary for high-quality specification hardening.

In addition, the Vapocarb-Hump Furnace can be used to carburize and gas cyanide small loads.

For these uses the equipment provides atmosphere control, automatic temperature control and a record of time and temperature . . . all the factors necessary to assure desired case depth.

THE STEAM HOMO FURNACE The Steam Homo Furnace can be used as an air atmosphere tempering furnace—with all the advantages of the Homo Method—or with a steam atmosphere, making it applicable to a great variety of other operations. Applications utilizing this steam atmosphere include steam-treating high speed steel cutting tools and bluing of iron and steel parts.

Non-ferrous applications include solution heat-treating of aluminum, precipitation hardening of beryllium copper and the annealing or stress relief of brass . . . all accomplished in the Steam Homo without scale, eliminating many expensive cleaning, buffing and pickling operations.

For complete information regarding this furnace team, write 4966 Stenton Ave., Phila., 44, Pa., or contact our nearest office.

LEEDS  **NORTHROP**
instruments automatic controls • furnaces

Why leading diesel engine builders say—

It's *Purolator** for Full-Flow!

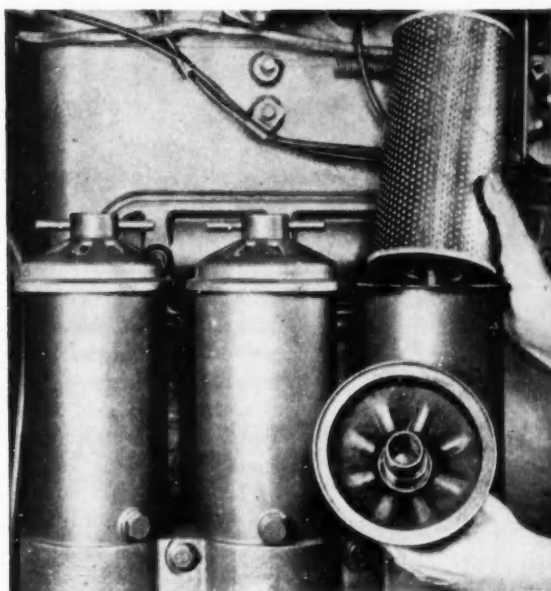


- **Full-flow rates within practical filter dimensions:** Purolator's famous "accordion-pleated" Micronic* filter element has up to ten times more filtering area than old-style filters—gives high flow rates in a minimum of space.
- **Ultra-micronic filtration:** High flow rates are, of course, meaningless unless effective filtration is maintained, too. Electron micrographs prove that the Purolator Micronic filter stops particles down to *submicrons*—.0000039 in.!
- **Maximum dirt storage capacity:** The pleated design of the Micronic filter element provides many times more dirt storage space than old-style filters. This important advantage means uniform, efficient performance and a lengthy service life.
- **Minimum pressure drop:** The Purolator Micronic filter element introduces a remarkably small pressure drop in the lubricating system . . . permitting pumps of practical size and simple type.
- **Will not remove or absorb additives:** With Purolator Micronic filtration, you keep *all* the oil quality you pay for. The Micronic filter element will not strip additives . . . an important advantage with HD and heat-resistant oils

Modern engines with full-flow lube systems . . . which filter *all* the oil at each pass through the engine . . . demand the best in filters. And most leading makers of diesel engines and vehicles agree that the best is *Purolator** . . . a fact proved over and over by their own impartial tests.

The story's the same with gasoline engines, too! The world's best known producers of passenger cars, trucks, tractors, earth-moving equipment, and stationary engines have found Purolators best . . . and install them as standard factory equipment.

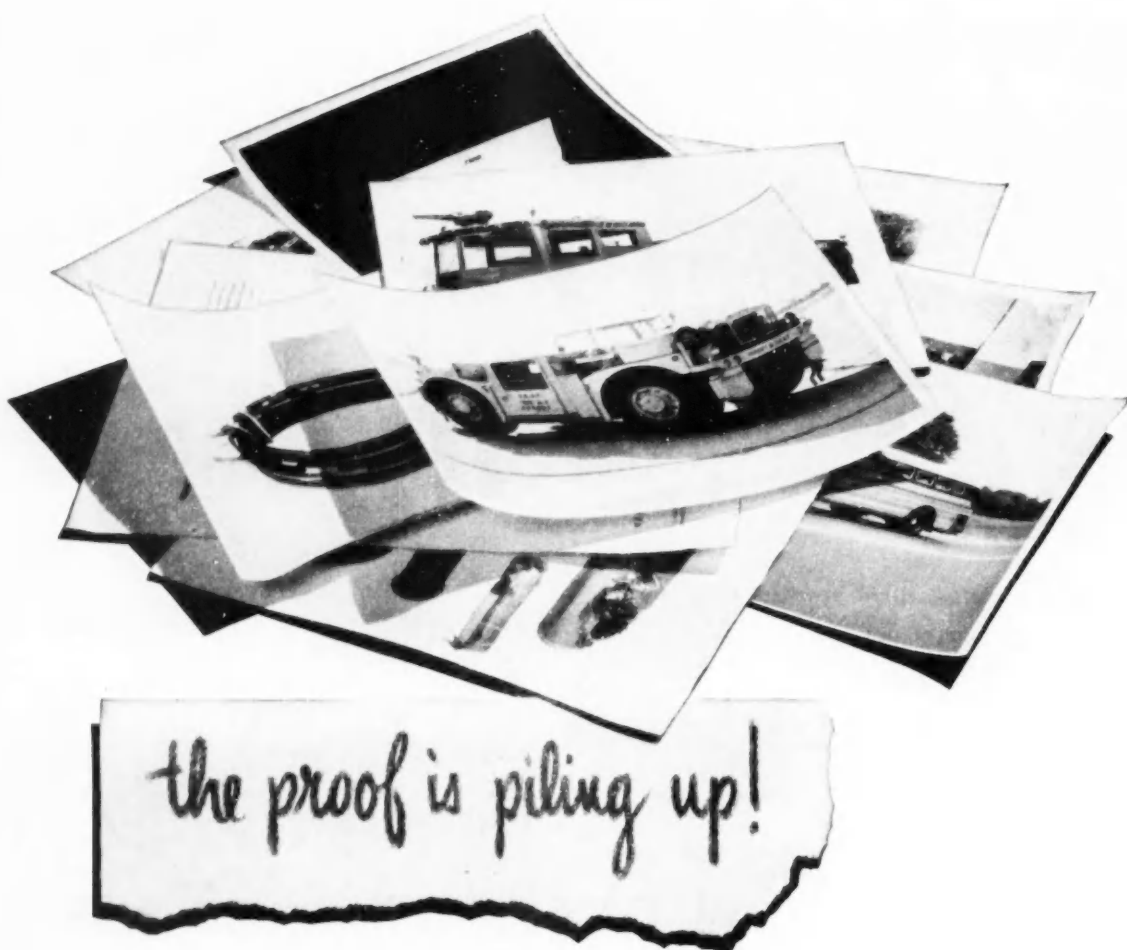
If you are contemplating new designs or modifications of existing ones, remember . . . there's a well-engineered and use-tested Purolator for *any* filter application, including fuel oil, gasoline, hydraulic fluid, and water. Write for the Purolator catalog issued for your special field.



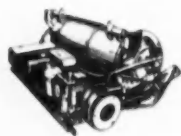
Purolator Micronic Filters in a typical Diesel full-flow installation. Although the Purolator Micronic filter elements measure only 4½ in. by 9 in., each one filters 9 gallons of oil per minute, giving a total of 27 g.p.m. for the complete filter unit.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey, and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles
*Reg. U.S. Pat. Off.





Janitrol liquid heater-equipped bomber tow tug starts reliably after 72-hour cold soak at minus 65°F, without special fuel capsules. Engine temperature raised to 155°F in 60 minutes . . . Heater specifications on Air Force crash truck met in full by Janitrol heater, which provides heat for defrosting, cab comfort, auxiliary generator, and main water supply . . . Stationary diesels winterized by Janitrol . . . Transit operators report Janitrol-equipped coaches run longer between overhauls, substantially reduce maintenance . . . The proof is piling up: that Janitrol heaters pay off the original investment in lower maintenance and positive, all-weather dependability.



"Janitrol liquid heater equipped" means dependability—proved for seven years



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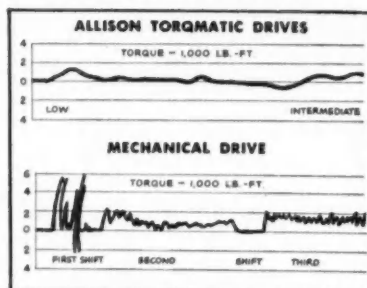
To demonstrate this, Allison engineers measured power-train shock loads in a large number of earth-moving, coal and ore-hauling trucks under both normal and extreme operating conditions. These charts show the results.

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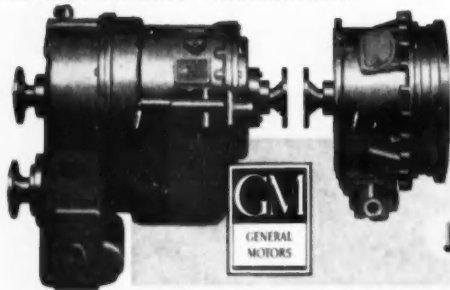
ALLISON Division of GENERAL MOTORS
Box 894AA, Indianapolis 6, Indiana

POWER-TRAIN SHOCK LOADS



Note the jagged line—shock loads—as the mechanical drive truck pulls away from the shovel and shifts from first to second gear. Compare the smooth line—no harmful shock loads—for the truck equipped with Allison TORQMATIC DRIVES.

MATCHED UNITS BUILT BY ONE MANUFACTURER



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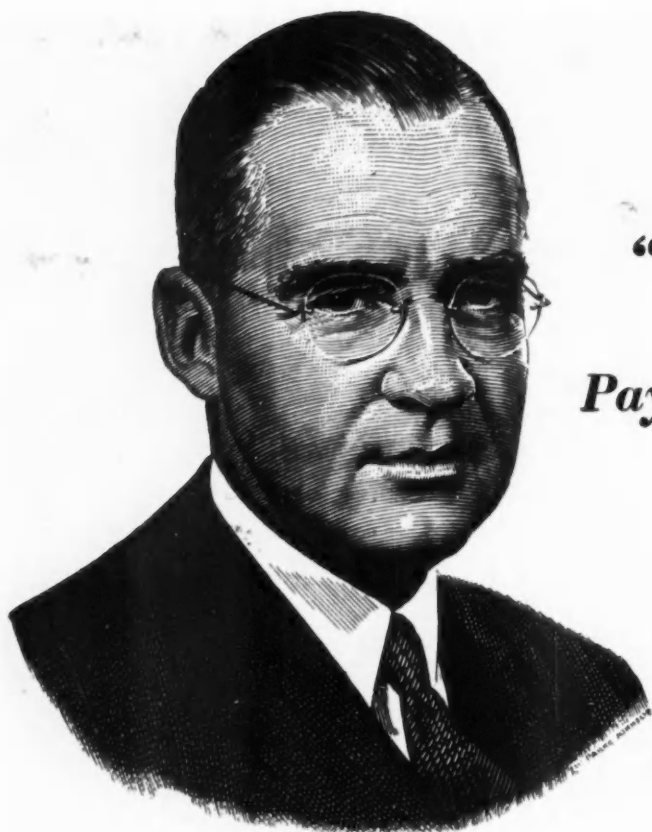


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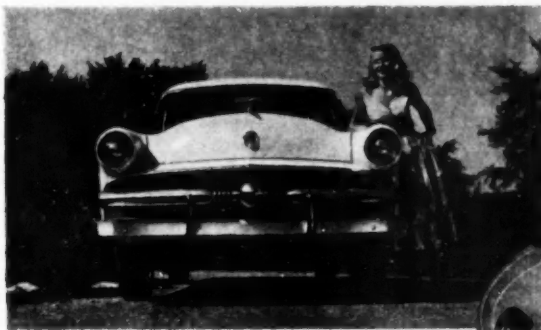
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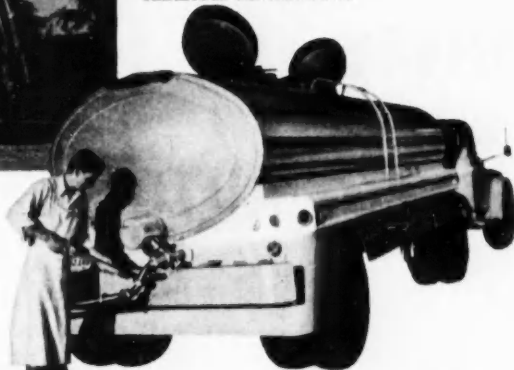




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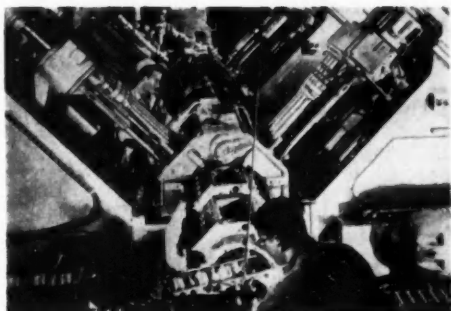


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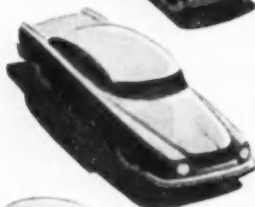
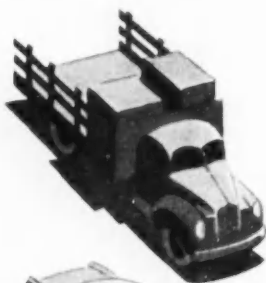
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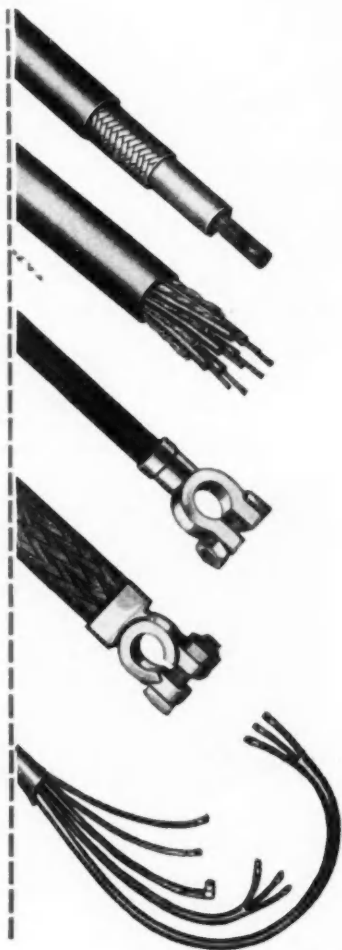


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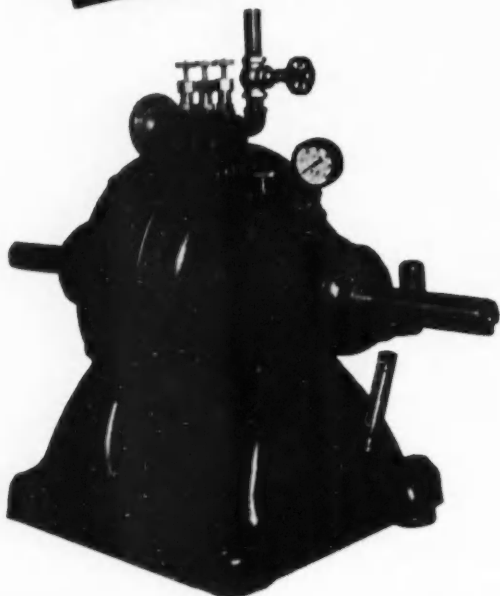
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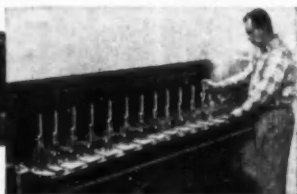
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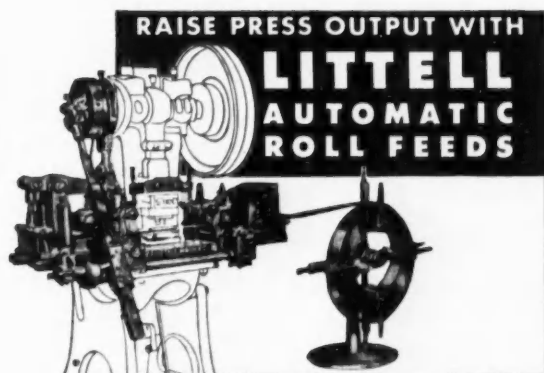
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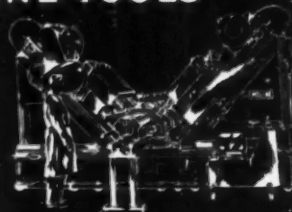
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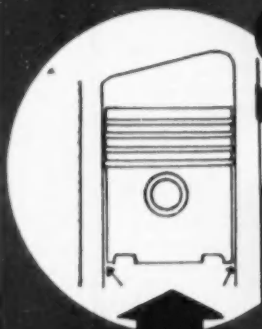
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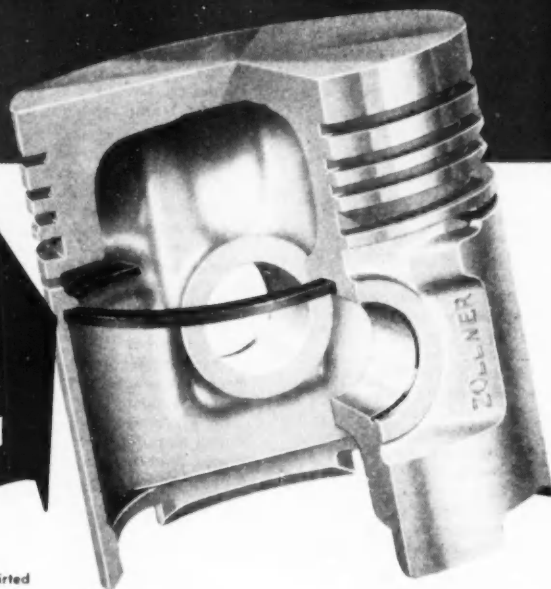
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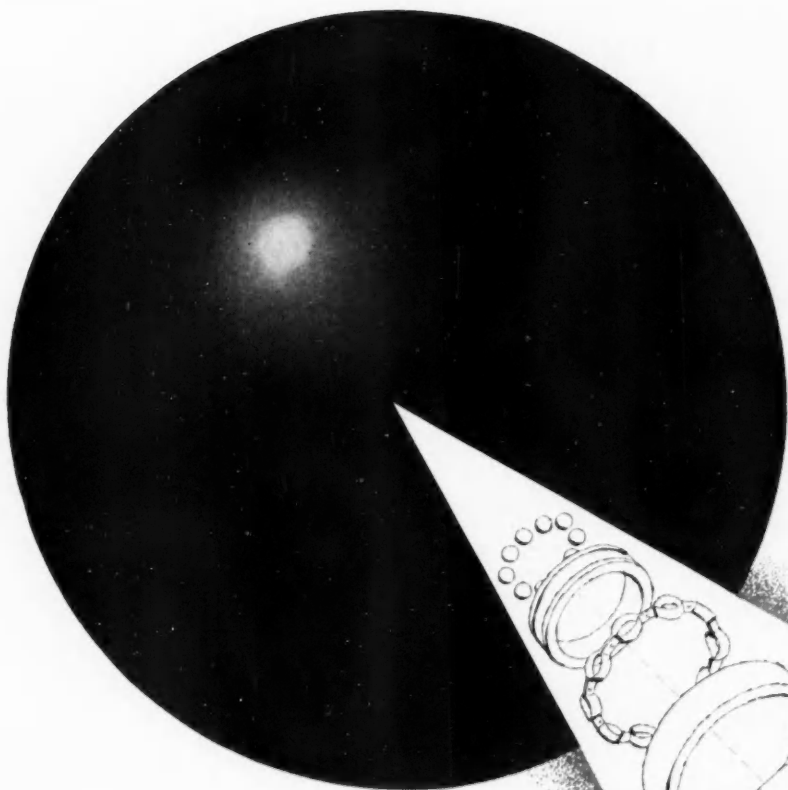
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